RAILROAD GAZETTE

FRIDAY, JANUARY 6.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Meetings Next Week.—Georgia Company; Manhattan.

Elections.—Atlanta & Great Western, George T. Fry, President.—Fort Worth Western, W. H. H. Lawrence, President.—Louisville & Nashville, R. Montfort, Chief Engineer.—New York Central & Hudson River, G. H. Worcester, Superintendent of Harlem Division.—Seneca Falls & Cayuga Lake, Henry W. Pope, President.—Rutland, P. W. Clement, President.

New Companies Organized.—Anaheim, Olinda & Pomona is incorporated in California.—Atlanta & Great Western is chartered in Georgia.—Ellsworth & Limestone Valley is incorporated in Kansas.—Ferries & Cliff House is incorporated in California.—Odessa, Fort Stockton & San Antonio obtains charter in Texas.—Plattsmouth Belt Line is incorporated in Nebraska.—Quincy & Beardstown Short Line files articles in Illinois.

Changes and Extensions.—*California:* Atchison, Topeka & Santa Fe will build branch to Redondo Beach.—*Colorado:* Denver, Texas & Fort Worth will extend road from Trinidad to Las Vegas, N. M.—*Georgia:* Atlanta & Florida completed to Fayetteville.—*Kansas:* Arkansas, Kansas & Colorado completed from Bucklin to Dodge City; Atchison, Topeka & Santa Fe completes Strong City extension to Concordia.—*Kentucky:* Louisville & Nashville extended from Corbin to Barboursville.—*Michigan:* Cincinnati, Jackson & Mackinaw is completed to Addison Junction; Duluth, South Shore & Atlantic is completed to Sault Ste Marie.—*West Virginia:* Ohio River is completed to Guyandotte.

Traffic.—Anthracite coal shipments for the week ending Dec. 31 show a decrease of 2.2 per cent., as compared with the same period last year; bituminous shipments show an increase of 30.3 per cent. Cotton receipts, interior markets, for the week ending Dec. 30 show a decrease of 22.6 per cent., as compared with the corresponding week last year; shipments show a decrease of 7.3 per cent.; seaport receipts show a decrease of 20.2 per cent.; exports a decrease of 21.8 per cent.; cotton in sight is less than at the same date last year by 4.6 per cent.

Earnings.—For the month of December 10 roads report gross earnings, all showing an increase; 24 roads report gross and net earnings for the month of November, 1 showing a decrease in gross and 10 a decrease in net. The total gross increase is $2,142,278, or 11.4 per cent., and the total net increase is $382,883, or 5.0 per cent. For the 11 months ending Nov. 30, 19 roads report gross and net earnings, none showing a decrease in gross and 5 a decrease in net. The total increase in gross earnings is $15,899,571, or 10.7 per cent., and the total net increase is $4,461,805, or 7.7 per cent.

Miscellaneous.—Philadelphia & Reading passes out of the Receivers' hands.—Poughkeepsie & Southwestern and Poughkeepsie, Hartford & New England consolidate.

Contributions.

Personal Property in Sleeping Cars.

NEW YORK, Dec. 24, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The recent decision of the General Term of the New York City Court, in the case of Carpenter *vs.* N. Y., N. H. & Hartford Railroad Co., calls attention once more to the question whether travelers in sleeping cars are entitled to better protection for their valuables than they at present receive. In this case the plaintiff testified that he retired, putting his vest, containing $40, under his pillow, and that in the morning the money was gone; furthermore, that the porter blacked his shoes, and, therefore, could not have been on watch all the time. The Court dismissed the case on the ground that no negligence had been proven. Even had the plaintiff been successful, the process of recovering damages would probably have been expensive and tedious, because railroad companies are accustomed to avail themselves of all the legal delays and technicalities which issue from the brains of cunning and skillful lawyers, in the hope of causing plaintiffs to pause and consider before attacking these powerful corporations.

But is not the present process of intrusting valuables to the guardianship of the intelligent colored gentleman who is popularly supposed to be animated principally by the desire of collaring the passengers' quarters rather an antiquated method? And is it not reasonable to think that the mode of caring for watches, jewelry and money, practiced in our hotels, at our bathing pavilions, Turkish baths, gymnasiums, etc., would work well in the case of our sleeping cars—and that a strong-box, or safe, wherein the passengers could place their valuables, would offer more security than is obtainable by the present process?

The first railroad company which adopts a rational method of caring for the valuables of sleeping passengers will probably obtain such a large increase of business that other corporations will soon fall into line.

RICHARD H. BUEL.

Report of the Pacific Railroad Commission.

The commission appointed to investigate the condition of the various Pacific railroads which have been aided by the Government has presented to the President two reports. The majority report is by Messrs. Anderson and Littler; Chairman Pattison makes a minority report, which is much severer than the other, recommending the forfeiture of all the charters; that receivers be appointed to secure the government claims, and that the companies be dissolved and the roads sold to private corporations. It also recommends that suits be instituted against most of the managers of the roads for maladministration and misapplication of funds.

The majority report is divided into three parts. The first gives the present condition of the roads and their relations to the Government; the second is devoted to financial questions, and the third covers the points specially mentioned in the act of Congress under which the investigation has been made. In speaking of the Union Pacific, the Commissioners say that the various branches which have been built by separate companies, but in the interest of the Union Pacific, are, as a whole, an advantage to the main road. Some of them have to be run at a loss, but the business they bring to the main line is of great advantage to the latter. As the Union Pacific holds most of the bonds of these auxiliary roads, it could effect no important saving of interest payments by discontinuing the operation of the lines. Figures are given showing that the fixed charges of these branches amount to $2,579,360, and that the direct and indirect income is nearly twice this amount. The branches and main line are deemed mutually dependent on each other for support and development, and either, if separated from the other, would be greatly reduced in value. The net earnings of the system for the past two years have averaged $9,800,000, of which $8,200,000 should be credited to the main line and $1,600,000 to the branch system. Colonel Morgan, who made a critical examination of the road, estimates the actual present value of the system, based on the cost of construction, increased value of right of way and plant, and estimated earning power of the main line as, approximately, $150,000,000.

INDEBTEDNESS.

The total funded debt of the Union Pacific Dec. 31, 1886, exclusive of the obligations to the United States, is placed at $81,969,127, of which $33,532,000 was prior to the United States statutory lien. The Union Pacific Co. has issued $48,000,000 bonds on its main line, which are subsequent to the lien of the United States, $35,394,000 thereof being covered by securities other than that of the main line itself, such as land grant and sinking fund bonds, etc. A mortgage executed to the United States now would, therefore, be subject to the burden of about $13,000,000 in addition to the first mortgage and the debt due to the United States. The indebtedness to the United States is as follows:

Union Pacific Railroad		$27,236,512
Kansas Pacific Railroad		6,303,000
Union Pacific, interest accrued to Nov. 1, 1887, but not due		32,030,343
Kansas Pacific, interest accrued to Nov. 1, 1887, but not due		7,768,113
Total		$73,346,968
Amount in United States bonds and interest account for both companies	$15,440,891	
Amount in sinking fund account to Nov. 1, 1887	7,734,084	
		23,174,976
Present balance of obligations of the Union Pacific Railway		50,171,992

The *present value* of the debt is computed as follows:

Principal, Union Pacific and Kansas Pacific	$33,539,512
Add 180 per cent. interest	60,371,121
Total debt at maturity	$93,910,633
Deduct amount to credit of both companies in bond and interest account Nov. 1, 1887	15,540,892
Balance at maturity of bonds	$78,369,741

The average date of maturity of the debt of both companies is July 10, 1897.

The approximate present value of $78,369,741, discounted at 3 per cent., compounded, is	$58,491,256
Deduct amount in sinking fund	7,734,083
Present value	$50,757,173

The requirements, under the provisions of the mortgage proposed by the bill, would be as follows for the first ten years:

Three per cent. of $50,757,000	$1,522,710
One-half of 1 per cent. of outstanding bonds	253,785
Total	$1,776,495

And after the expiration of ten years the annual requirement would be $2,030,280.

It is universally conceded that the Union Pacific Railway proper, or its system, cannot pay the indebtedness due the United States at maturity. The Commission, therefore, submits to Congress a bill which embodies a scheme for securing full payment of all debts due the United States, with a reasonable rate of interest, having due regard to the financial ability of the company and the proper serving of the public in the conduct of its business. The present plan of requiring annual payments of a percentage of net earnings is declared impracticable. The bill submitted provides for payments to be made by the respective companies in proportion to the semi-annual amount of interest accruing on their bonds and also in proportion to a fixed percentage of the outstanding bonds. In the event of a refusal on the part of the companies to accept the terms of these bills, the Commission is unable to present any system of fixed payments.

The Commissioners say that the assets of the Union Pacific have been in former years largely misapplied, and that the present financial weakness of the road is due to the action of unfaithful officers. They allude with regret to the decision of the Supreme Court which prevents the Government from suing the road until the maturity of the debt. The Court assumed that the original plan providing for payment to the Government of 5 per cent. of the net earnings and half rates on Government transportation would be sufficient to satisfy the Government's claims; but this has proved fallacious. As the Government cannot, according to the just cited decision, institute any suit, the proposed bill contains a clause requiring the company, as a corporation, to sue such officers as the Attorney General may direct.

THE CENTRAL PACIFIC.

The Central Pacific is taken up in the same manner as the Union Pacific. The valuation of Colonel Morgan is $110,000,000, but the Commissioners regard this figure as excessive, as he estimates the cost of reproduction at $51,000,000. The statutory liens on both the Union and Central Pacific are regarded as of a very unsatisfactory nature. The bonded debt is figured at $62,387,000, which, with the government lien of $27,855,680, gives a total funded debt of $90,242,180, which is a lien on the Central Pacific or some part of the same. There are $4,570,000 land grant bonds, and some fifty year bonds, which are a lien on the land grant; these slightly relieve this burden, but there remains a total funded debt of $57,817,000, exclusive of the obligations to the United States, which amount exceeds the estimated cost of reproducing all these roads. A present mortgage given by the Central Pacific, embracing the entire 1,357 miles of the road as now consolidated, would, therefore, give but little additional security to the present statutory lien. It has, however, as in the case of the Union Pacific, the advantage of gathering together and placing within the control of the creditor a complete mortgage of the entire railroad, including the California & Oregon, the San Joaquin Valley, the San Francisco, Oakland & Alameda branches, and the terminal facilities at Oakland and San Francisco. The amount of the debt due the United States is figured at $60,218,961, from which is to be deducted the amount of the bond and interest account held by the United States, $6,203,379, and the sinking fund of $3,418,396, making the net amount of the obligation $50,596,585.

The *present value*, however, is as follows:

The principal of the debt of the Central Pacific, including the Western Pacific, is $27,855,680, to which is to be added 180 per cent. interest, $50,140,224, making the total debt at maturity $77,995,904. From this is to be deducted $6,203,379, bond and interest account, leaving a balance of $71,792,525 as the debt at maturity of bonds. The average date of maturity of the Central Pacific is Nov. 18, 1897, and of the Western Pacific, Sept. 5, 1898.

The approximate present value	$71,792,524
Discounted at 3 per cent. is	22,750,000
Deduct amounts in sinking funds	3,418,996
Total	$49,331,004

The requirements under the provisions of the mortgage proposed by the bill would be as follows for the first 10 years:

Three per cent. of $49,331,004 is	$1,479,930
One-half of one per cent. of outstanding bonds	246,655
Total	$1,726,585

And after the expiration of 10 years, the annual requirement would be $1,973,240.

The Commissioners find the problems connected with the Central Pacific more difficult even than those of the Union Pacific, the entire net earnings of the road being insufficient to meet the current interest charges due to the Government; and enforcement of the liens either at maturity or earlier would result in a sale which would simply turn the road over to the present managers as a gift. Profligacy and wanton dispersion of assets in dividends and in extravagant contracts, persisted in to the present time, have wasted $34,000,000 of the Central Pacific's money.

The Central Branch, Union Pacific, 100 miles long, is declared to be well-constructed, fairly equipped and able to maintain and probably increase its earning powers. The cost of reproducing it in its present condition is estimated by Colonel Morgan at $2,000,000. Its average net earnings for three years past were $341,000.

The requirements under the proposed mortgage would be, on the basis applied to the other roads:

For the first ten years	$113,750

The Sioux City & Pacific is in such condition that it could probably meet its claims under the plan proposed for the larger roads, but being owned by the Chicago & Northwestern, its earnings are largely dependent on that company. The Commission therefore suggests the appointment by Congress of a board to conclude an adjustment of the indebtedness. Bills relating to this company and to the Central Branch, Union Pacific, are also reported.

The Commission then goes on to explain the advantages of its proposed plan as compared with the bills recently discussed in Congress. In the computation of the present value of the debt, the amount held in sinking fund is deducted *after* discounting the net amount of that debt at the maturity of the bonds, and not before effecting such discount. The discount is computed at 3 per cent. compound instead of 2 per cent. simple interest. A contract mortgage is proposed, to secure by 3 per cent. bonds and a sinking fund for the redemption of the principal of the debt at the expiration of fifty years. This is deemed a practicable provision to enable the enforcement of the government's rights in case of default; the enforcement of the statutory lien could result in nothing but the acquisition by the government of such portion of the roads as were subject to the liens; and as a fraction of the roads would be valueless by itself this lien is wholly useless. It is provided that dividends shall not be declared except from earnings of the fiscal year in which they are declared, and after all payments for interest and sinking fund shall have been made. In the event of the failure of any of the companies to accept the provisions of the act, the requirements of the Thurman act are amended so as to apply respectively to the existing condition of each company.

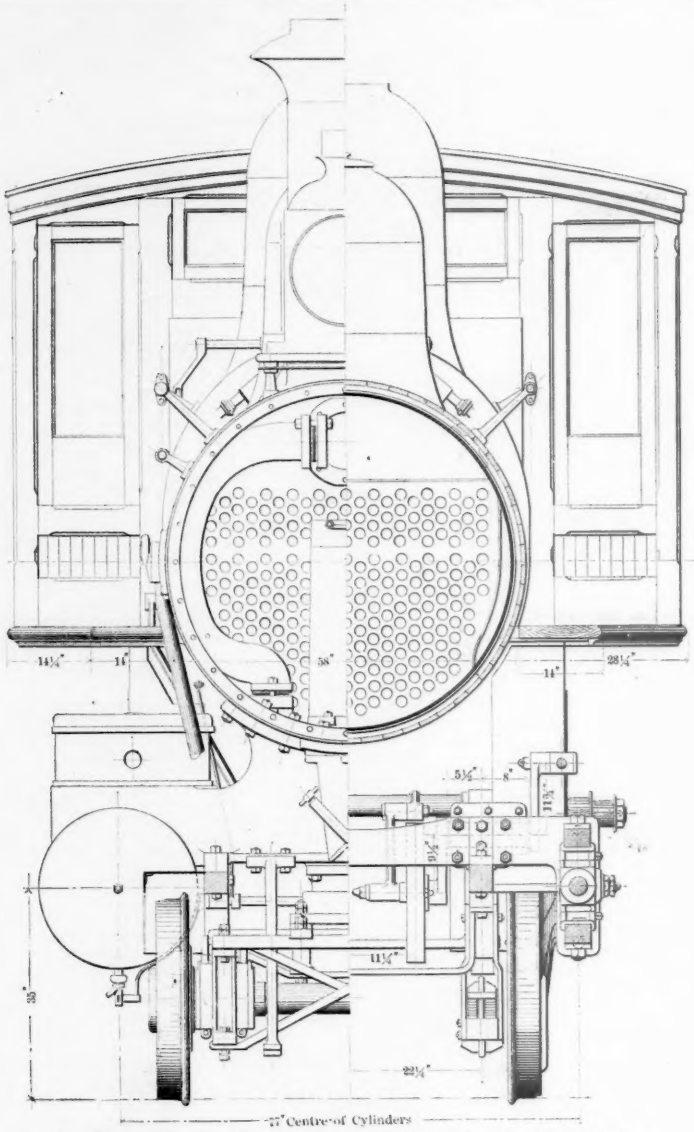
The majority report characterizes the report of Chairman Pattison as superficial and impracticable. His propositions are based on generalities applicable to almost all railroads and his report is a mixture of petty complaints and real grievances without a practicable remedy.

The report then goes on to state the amount of aid granted by the Government to the several companies as follows (the rate per acre of lands granted being in all cases $1.25):

	Bonds.	Lands. Acres.	Lands. Amount.
Union Pacific	$27,236,512	11,309,844	$14,137,305
Kansas Pacific	6,303,000	6,000,000	7,500,000
Central Branch U. P.	1,600,000	222,560	278,200
Sioux City & Pacific	1,628,320	43,336	54,170
Central Pacific	25,885,120	8,000,000	10,000,000
Western Pacific	1,970,560	453,794	567,243
Total	$64,623,512	26,029,534	$32,536,918
Total bonds and lands			$97,160,430

The Commissioners declare that all the duties and obligations attached to these grants have been persistently disregarded by every one concerned in the control of the companies, with the single exception of the administration of the Union Pacific since the spring of 1884, which "has devoted itself honestly and intelligently to the herculean task of rescuing the road from the insolvency which threatened it," and to which it is largely due that the United States holds in that railway (if protected by proper legislation) "full security for the repayment of its whole debt and of the interest."

The Commission then goes on at length to relate the connection of Jay Gould with the Union Pacific between 1873 and 1880, referring to improper votes in the Board of Directors and to Gould's extravagant attempts to construct a rival road with the purpose of destroying the value of the Union Pacific. From what is learned concerning Gould's dealings in Union Pacific shares, his purchases of Missouri Pacific, Kansas Central and other stocks at high prices, and his negotiations with the Boston stockholders of the Union Pacific, together with the bearings of other circumstances whose causes cannot be explained, it is concluded that the



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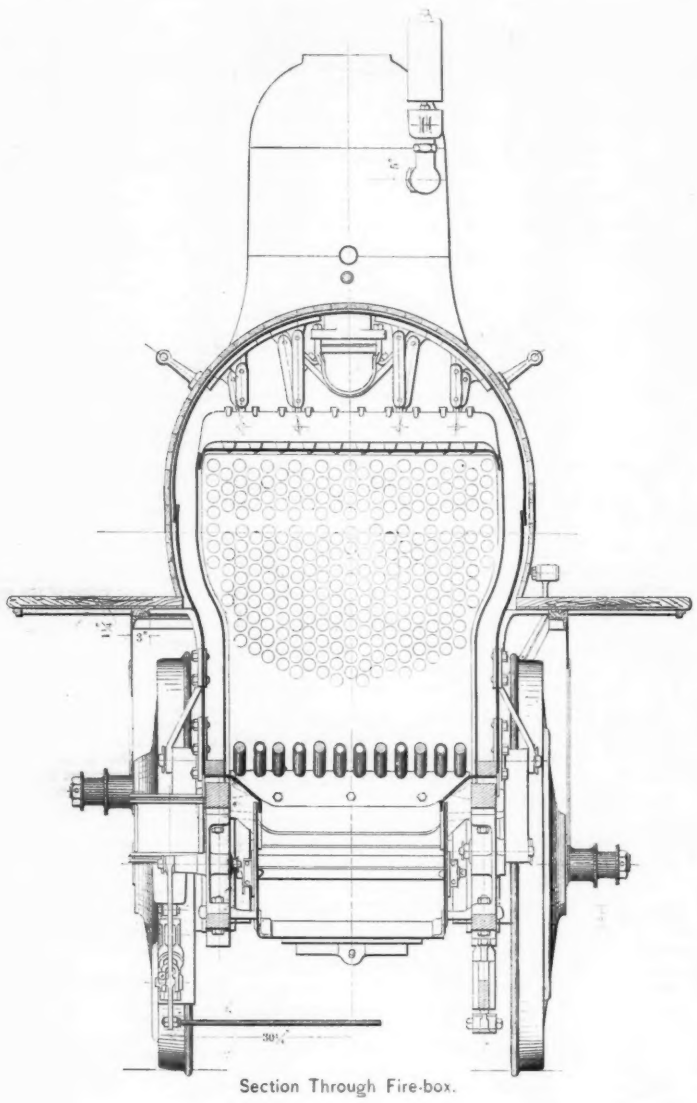

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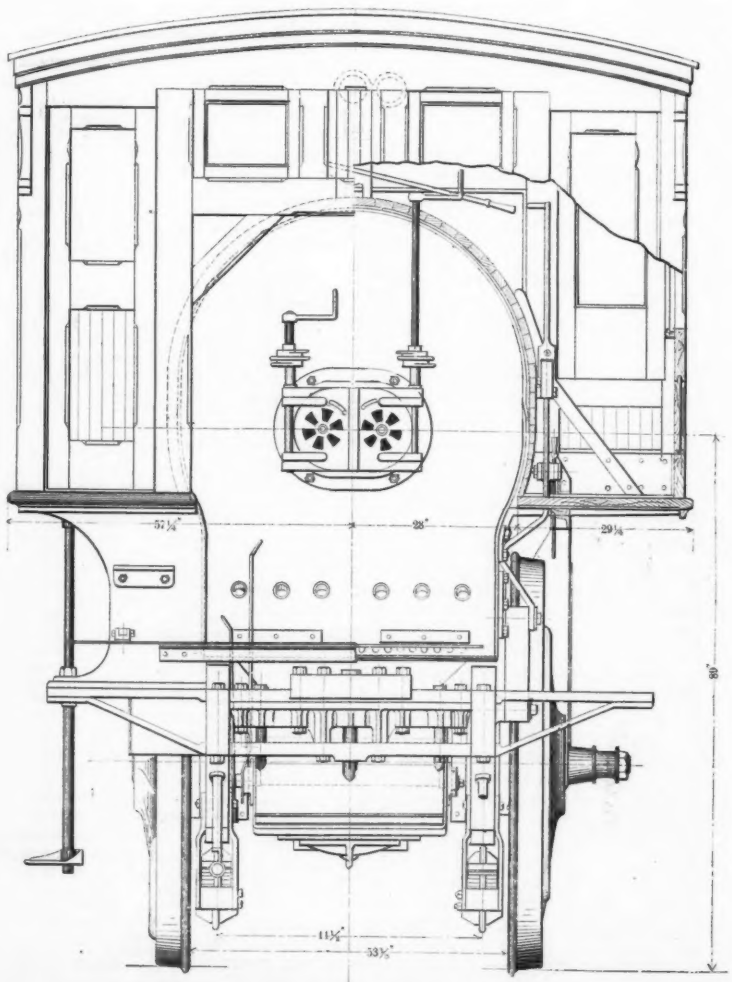
EXPRESS LOCOMOTIVE.

New York, Lake Erie & Western.



Hind Elevation.

consolidation of the Union Pacific, Kansas Pacific and Denver Pacific in 1880 was effected in violation of every principle which should control the actions of honest men. Mr. Gould's resignation from the directorship of all these roads on Jan. 10, 1880, four days before the consolidation was effected, is regarded by the Commissioners as a confession of conscious guilt.

The building of branches was actively carried on after the consolidation, but, in spite of largely increased business during 1880-81-82-83, the company found itself early in 1884 on the verge of bankruptcy, owing to competition, extravagant purchases by Gould, and lavish dividends. Gould's connection with the roads practically ceased in 1883; thenceforward the Commission finds the Union Pacific management conservative, energetic and intelligent.

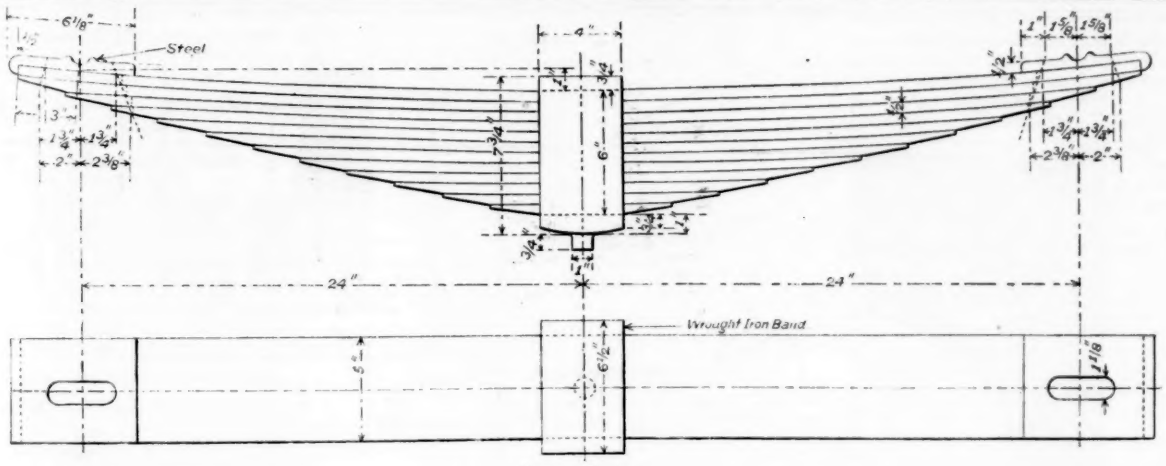
Turning again to the Central Pacific, the dealings of Messrs. Stanford, Huntington, Hopkins and Crocker in placing themselves on both sides of construction contracts at exorbitant rates is severely condemned. That these men have destroyed books containing evidence of their own guilt is deemed conclusively proved. The Commissioners treat of the several "development" or "improvement" companies, all formed by these parties, and present the following showing of the Central Pacific's payments for construction:

In cash	$41,573,719
In bonds	18 713,000
In stock	60,585,810
Total	$120,872,529
Total cost of construction as determined by Commission	$58,301,832
Leaving surplus profits of	$62,570,697

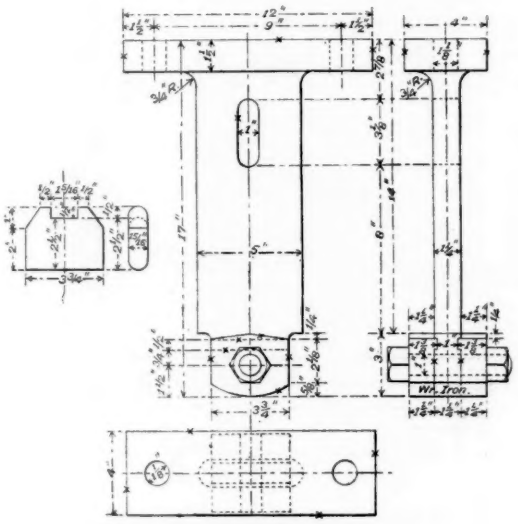
of which $60,585,810 was in stocks and $1,984,887 in bonds. All of this consideration was paid to Stanford, Huntington, Hopkins and Crocker, and was voted to themselves by their own votes. Another table is given of the construction of branch roads leased to the Central Pacific, in which the surplus profits above the cost of construction are stated at $55,539,555.

Extravagance in contracts with express companies, use of money to influence legislation, refusal to testify, the concealment of evidence, etc., are referred to at length. The earning power of the Central Pacific has greatly decreased since 1883. The officers claim that they have $62,873,557 in claims against the government, but only $1,853,323 is allowed by the Commission to be just. The Southern Pacific Co. has developed its other lines in such a way as to render the Central Pacific dependent upon them. Extravagance and misapplication of funds in the management of the Central Branch Union Pacific and Sioux City & Pacific, and in the transfer the stock of the former to the Union Pacific are set forth.

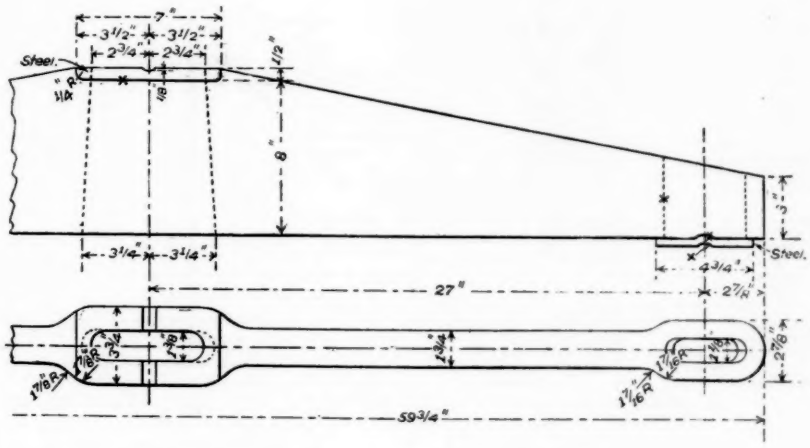
In answering the questions formulated by Congress, the Commission says: The obligation that stock shares must be fully paid in cash has not been kept by any road. The obligation to construct a first-class road has been complied with. The telegraph franchises have been illegally transferred to the Western Union, but some amendment has been made and the government's right to preference has been accorded. Troops, supplies and mails have been transported as agreed, and 5 per cent. of net earnings and half of transportation earnings



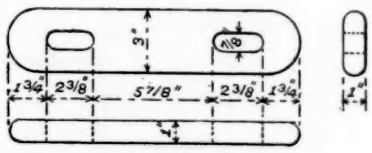
Driving Spring.



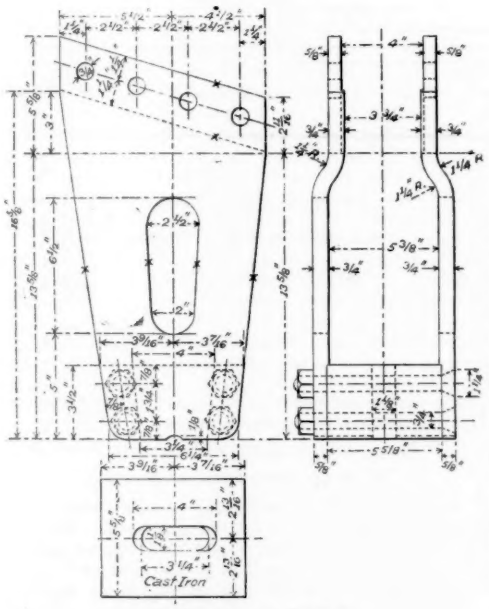
Equalizer Stand.



Equalizing Lever.



Spring Hanger.

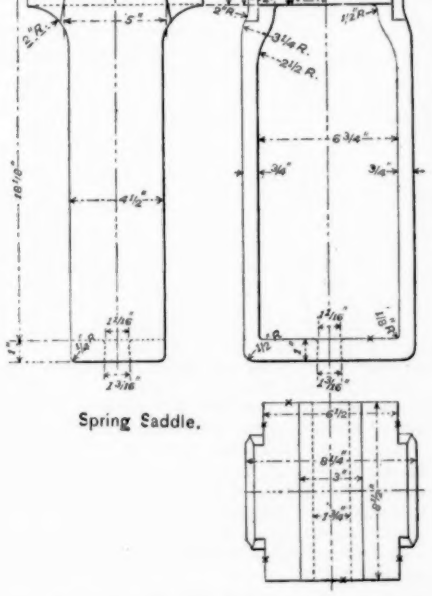


Spring Hanger Bracket.

EXPRESS LOCOMOTIVE.

New York, Lake Erie & Western.

DRIVING SPRING GEAR.



Spring Saddle.

The extravagance and violation of trusts referred to in the majority report are set forth with great particularity, and in addition, evasion of local taxation, extravagance in legal expenses, discriminations to shippers, etc., are fully rehearsed. It is concluded that the Government could not now recover within $108,000,000 of its just dues.

In conclusion, the mere collection of the money debt is deemed a secondary matter; the chief aim should be the restoration of the roads to their proper functions in honest hands. Extension of time for payment 50 years, as recommended by the majority Commissioners, only makes collection more difficult, and saddles future generations with the burdens of the Credit Mobilier. The whole question resolves itself into a choice of protecting the so-called innocent stockholders as against the consumers who pay $26,000,000 a year to the Union Pacific for transportation service. Eventually the consuming classes and not the stockholders must pay this bill if extension of time be granted. Default is sure to come in 1897, if not sooner, and the Government may as well proceed to extricate itself at once by annulling the charters. A receiver should be appointed. This course would be simple and direct.

have been applied to interest payments as the law required. Dividends paid have not been in violation of law, but the Commission disapproves of the policy of paying them when such large debts hang over the companies. Large rebates on freight have been paid to various heavy shippers, but there is no evidence before the Commission that there was a corrupt purpose in paying them; the claim of Commissioner Pattison that this policy was a violation of duty is protested against. Money of all the roads has been used to influence legislation, but there is no direct proof of actual bribery. The Union Pacific officers have used passes to influence legislation. All the roads have fairly served the public.

The report has been prepared by Charles P. Young, secretary and stenographer to the Commission.

The minority report gives the amount of subsidy bonds authorized by the Government as $64,623,512, and interest paid by Government on these for 30 years, $114,261,547; land has been granted to the extent of 26,000,000 acres; the roads have realized on this $39,479,213 and have $26,000,000 worth unsold. The companies have received $3,000,000 aid from other sources, and have had the advantage of $200,000,000, which represents the value of the annual advance of $3,877,410 made by the Government, which will not have to be refunded till 1895-99. By this figuring the Commissioner makes out a total of $447,729,471 aid extended.

In return for this the companies have violated agreements in all directions. Only $2,000,000 was received for $97,000,000 stock, which the officers swore was all paid in. The cost of the roads was $96,000,000, yet $268,000,000 stock and bonds were issued. Overcharges in Government transportation, etc., have been perpetrated to the extent of $8,000,000.

Express Locomotive New York, Lake Erie & Western.

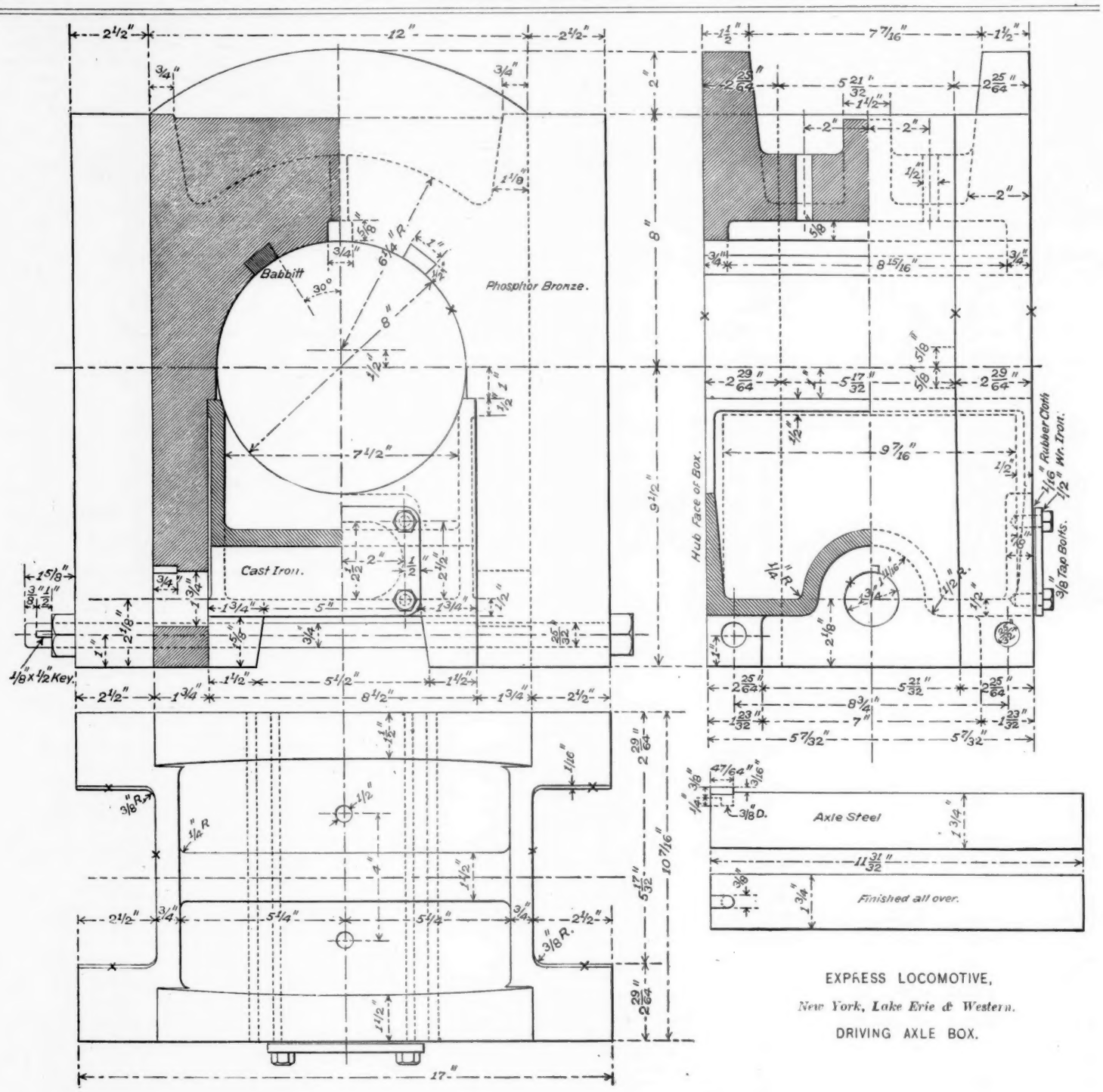
The accompanying engravings represent a fine express passenger locomotive recently built at the Susquehanna shops of the New York, Lake Erie & Western. Several of these engines have now been running express trains for some months and have given great satisfaction.

The engine has a large grate of no less than 40 sq. ft. area in order to burn anthracite coal. This kind of fuel is used in order that the passengers may not be annoyed with sparks and smoke, and it is hardly necessary to state that hard coal, when used in combination with this immense grate and an extension smoke-box, can be burnt without the emission of any sparks or dirt that can possibly annoy passengers.

In order to secure this large grate, the fire-box is placed entirely above the frame. This necessitates a departure from the ordinary method of placing the driving springs above the axle boxes In most engines with wide fire-boxes short equalizing levers, resting on the boxes, are used in conjunction with semi-elliptic and coiled springs. The elasticity of the latter style of spring differs, however, considerably from that of the semi-elliptic. and the multiplication of springs, pins and levers is a disadvantage. In the engine under notice the spring gear is arranged in a neat and mechanical fashion, and semi-elliptic springs and the ordinary arrangement of equalizing levers are employed. The springs, however, are placed beneath, instead of above the driving boxes. This arrangement necessitates a slight alteration in the construction of the lower portion of the axle box, which has now to carry the weight of the engine. The spring, which is of ordinary construction, rests in a stirrup, the upper end of which bears on a large pin 1¾ in. diameter passing through the sides of the box. A small tit or projection on the lower side of the spring band fits in a corresponding hole in the stirrup, and prevents the spring shifting endwise in the stirrup. A reference to the detailed drawings of the spring gear will make this clear. The bottom of the spring band or buckle is rounded so that it can rotate freely on the stirrup and accommodate itself to the movements of the equalizing lever.

The springs are of extra length and weight, but as they are much more accessible than when placed above the box, the difficulty of handling is not increased, and their position enables them to be easily taken down for repair or re-tempering. The pull on the box being direct, there is no tendency to cant or jam it in the pedestals. As, however, the oil cellar cannot be removed without taking down the spring, a small cover is bolted to the side of the cellar by means of which the interior is easily accessible for packing and examination.

The driving boxes are of very massive construction and as they are made of phosphor bronze, should be strong enough



EXPRESS LOCOMOTIVE,

New York, Lake Erie & Western.

DRIVING AXLE BOX.

to bear the pounding produced by running over frogs and bad joints at a high rate of speed.

The engine is fitted with the DeLancey balanced slide valve,* which is largely used on the Erie.

Among other improvements will be noticed the method of placing the cams of the driver brake so that they are pushed down instead of being pulled up to apply the brake. The air now acts on the upper side of the brake piston, and consequently cannot leak off at the piston rod gland. With the ordinary construction the piston rod is much exposed while running, to the dust and dirt thrown up by the drivers, and when the brake is applied this dirt is drawn into the gland, cutting the leather and causing leakage. This is entirely prevented by the arrangement on the engine under notice, as the piston rod is effectually shielded when running from dust and dirt. An ordinary car release spring is used to lift the piston and cams when the brake is released.

The rounded and flowing outlines of the dome casing and sand-box contribute to give the engine a handsome appearance.

The principal dimensions of the engines are as follows:

Cylinders, diameter and stroke	19×24 in.
Driving wheels, diam. on tread	68 in.
Truck wheels, " "	33 in
Tractive power, per lb. average pressure in cylinders	127.4 lbs.
	Ft. In.
Wheel base, driving	8 6
" " truck	8 7
" " total	23 5½
	Sq. ft.
Heating surface, flues external	1,470.5
" " fire-box	179.0
" " Total	1,649.5
Grate area	40.0
	Lbs.
Weight, in full working order, drivers	78,000
" " " " truck	37,000
Total	115,000

* Detailed drawings of this valve, with particulars of its performance, are given on page 73 of *Recent Locomotives* (enlarged edition).

The South Milford Collision.

Another collision has been made the subject of a report by the Massachusetts Commissioners, two New York & New England passenger trains having met each other under the most inexcusable circumstances near South Milford, Dec. 14. One of the trains was running quite slowly and the men on the engines jumped off, but a baggage master was killed.

The Milford & Woonsocket road, W. W. Jenckes, Superintendent, was leased Oct. 1 to the New York & New England, Mr. Jenckes being retained as "general agent" and "no change made in his duties, except in certain pay-roll matters." Apparently the old train rules continued in effect until Dec. 11. On that day (Sunday) Mr. Jenckes convened a meeting of the trainmen of the Milford Branch to study the new time-table and rules which were to go into effect the following day, and it is agreed that Mr. Jenckes and all the men interpreted them alike. Trains running from the main line toward Milford (odd numbers) had the absolute right of track over those of the same grade running from Milford towards the main line (even numbers). On Wednesday, the 14th, train 167 was late and 166 waited for it at Milford. After waiting ten minutes Jenckes, who was there, told the engineman to proceed, and, it is said, ordered this done against the judgment of the engineman, starting the train without an order from the conductor. Jenckes got on the engine, apparently to reassure the runner. After they had gone a short distance at about 15 miles an hour Jenckes ordered the speed reduced on curves, so that at the time of the collision it was only about eight miles an hour. It was about 5 p. m., or at least so dark that the first seen of the opposing train was the headlight. It appears Mr. Jenckes got the old and new rules confused, and at the investigation he acknowledged the blunder. There had been telephonic communication between the stations of the Milford & Woonsocket, but the instruments were removed by the New York & New England. Telegraphic service was to be established in its place, but had not yet been provided. The commissioners make no decision except to say that Jenckes has not the qualifications for a train dispatcher.

Railroad Accidents in Belgium.

Statistics have lately been published of accidents on the state railroads of Belgium for the year 1886. There were 113 derailments and collisions. Of these 30 were accidents to passenger trains, against 124 in 1880, and 83 to freight trains, against 234 in 1880. The average is one derailment or collision to 183,500 train-miles, against one accident to 53,800 train-miles in 1880. The number of accidents has diminished steadily the last 7 years. The result is attributed largely to the increasing use of appliances to secure the safety of trains. The casualties were 3 passengers injured, 2 employés killed and 20 injured—25 casualties to persons in 1886, against 69 in 1885.

There were 480 injuries to persons in 1886, and 517 in 1885 by accidents due to other causes than derailments and collisions. Of these, 3 passengers were killed and 40 wounded. Of others than passengers 53 were killed and 31 wounded. The mortality in this class corresponds to that among trespassers on tracks on American railroads. That is, 63 per cent. of the injuries were fatal, which, we have seen, is the precise figure arrived at from the statistics of 10 years compiled by the Massachusetts Railroad Commissioners. Of employés, 56 were killed and 297 wounded in accidents other than collisions and derailments. Of the victims other than passengers and employés, 21 were suicides.

The Track Trespasser.

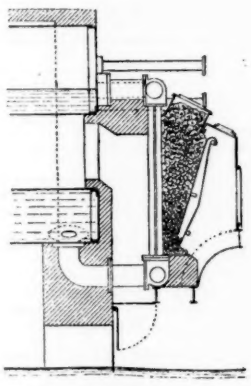
The annual report for 1886 of the Railroad Commissioners of Michigan contains the following passage, which deserves the careful consideration of railroad officers and of legislators.

"The army of trespassers upon trains and tracks, made up

largely of the irrepressible tramps that swarm through the country, and generally along the routes of the railroads, oftentimes stealing hand cars, turning switches, firing bridges and buildings, and committing other depredations upon the line of road they infest, as usual figures largely in the casualty reports to this office. No fewer than 57 of that restless class were killed outright, and 45 others injured on the railroads of the state during the last year; and still, unrestrained as they are by police regulations of sufficient stringency to prevent their intrusion upon the path of the locomotive, the 'course of their slaughter' goes mercilessly on. Possibly fate has no better fortune in store for these poor outcasts, but it does seem as if the lawmaking power might place some restrictions upon their habit of walking railroad tracks without prejudice to the convenience and liberty of the resident citizen. Liberty to be killed is of the essence of anarchy."

The Donneley Fire Grate for Boilers.

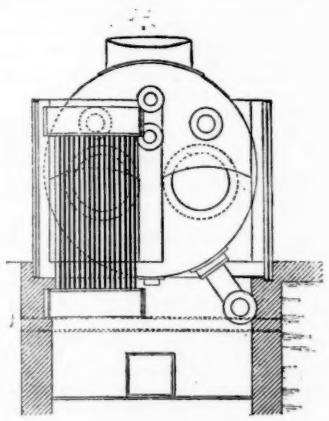
The illustrations of the Donneley fire grate are reproduced from an article by Herr Schneider, Chief Engineer of the Berlin Boiler Inspection Society, printed in *Glasers Annalen*. They require but little explanation. The coal is held between two grates, of which that on the boiler side is vertical and formed of a set of water tubes connecting with the



Longitudinal Section.

boiler above and below. The other grate is of the usual pattern, slightly inclined, the two grates forming a hopper, in which the fire is kept of a uniform thickness at any given level, without attention from the fireman. The coal is put in at an opening above which has a close cover. It falls downward as it burns, the clinker coming out at an opening left below the outer grate. The grates are inclosed outwardly by an iron casing with doors for clearing the grate, provided with dampers for draft regulation. The space between the water grate and the boiler forms a combustion chamber with a door at the bottom for the removal of dust, and an air damper at the top directly in front of the water grate. The grate orifices are cleaned very conveniently with a sword-shaped poker.

Last July, Herr Schneider, with two of his assistants and Herr Abel, Chief Engineer of the Märkisch Boiler Inspection Society undertook a test of this system of firing in comparison with the usual horizontal grate. The experiments were made at the Berlin Natural Science Museum with two boilers of exactly the same pattern (gases passing through the boilers by two flues, returning along the sides, and then passing beneath the boilers to the chimney), each 26 ft. 3



Elevation.

in. long, 6 ft. 7 in. diameter, and with two 2 ft. 3½ in. flues. Owing to the arrangement of the grates the heating and grate surfaces differed slightly of necessity. They were as follows:

	Heating surface.	Grate surface.
Horizontal grate boiler	679 sq. ft.	26.9 sq. ft.
Donneley grate boiler	746 "	19.3 "

The regulation of the fire with the Donneley grate is effected simply by the smoke damper. Four kinds of coal were tried. The results were as follows:

First experiment: Upper Silesian lump coal; chemical composition: carbon, 76.28; hydrogen, 4.75; oxygen, 10.69; sulphur, 0.80; water, 4.63; ash, 2.84.

Results of Experiment.

	Donneley	Horizontal grate.
Length of trial, hours	9¼	8
Coal consumed, lbs.	4,965	2,664
" per hr. p. sq. ft. of grate, lbs.	28	12
Water evaporated, lbs	38,057	17,730
Temperature fed water, degrees F	54	54
Steam pressure, lbs	58	59
Hot gases, carbonic acid, per cent.	14 78	10.35
Temperature, deg. F	498	548
Evaporation, lbs. water per lb. coal	7.66	6.05
Ditto, reduced to steam at 212° and water at 32° Fahr	7.70	6.09
Ditto, per sq ft. heating surface per hour	5.2	3.3
Efficiency, percentage of total heating power of coal	69.3	60.1

From which it appears that the Donneley firing surpassed the other in results by the following percentages:

Evaporation per pound of coal	15.3 per cent.
Steam production per square foot of heating surface	60.0 "

The Donneley grate gave almost no smoke, while the other smoked considerably.

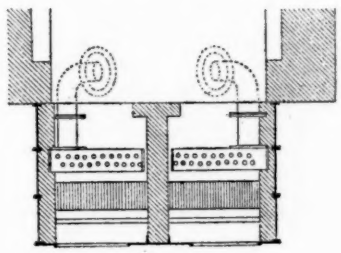
Second experiment: Nut coal from the Louisa mine; composition: carbon, 77.5 per cent.; hydrogen, 4.63 per cent.; oxygen, sulphur and nitrogen, 10.24 per cent.; water, 2.79 per cent.; ash, 4.84 per cent.

Results of Experiment.

	Donneley I.	Donneley II.	Horizontal grate.
Length of trial, hours	7¾	8	8
Coal consumed, lbs.	2,534	3,951	3 674
" " per hour per sq. ft. grate area	17	24	16
Water evaporated, lbs	20,695	20.444	24,829
Temperature feed water, deg. F.	54	54	54
Steam pressure, lbs	69	74	69
Hot gases, carbonic acid, per cent.	15.06	11.90	10.50
Temperature, degrees F	387	403	464
Evaporation, lbs. water per lb. coal	8.16	7.70	6.75
Ditto reduced to steam at 212° and water at 32°	8.22	7.75	6.80
Evaporation per sq. ft. heating surface per hour	3.6	4.8	4.3
Efficiency, per cent. of total heating power of coal	73.2	69 0	60.5

The Donneley grate surpassed the other in the first part of this experiment 21 per cent. in evaporation per pound of coal, but was beaten in steam production per unit of heating surface 16.8 per cent.

In the second part it was ahead 12.4 per cent. in evaporation and 10 per cent. in ratio of steam to heating surface.



Plan.

The first trial of the Donneley gave no smoke. In the second one, made simultaneously with the other boiler, the chimney showed considerable smoke, which was attributed to the other boiler.

Third experiment with coke: Composition: carbon, 77.65; hydrogen, 1.57; sulphur, 3.95; water, 3.24, ash, 13.59.

Results of Experiment.

	Donneley.	Horizontal grate.
Length of trial, hours	9	8
Coal consumed, lbs	3,436	2,758
" per hour, per sq. ft. of grate.	20	11
Water evaporated, lbs	27,612	19,710
Temperature feed water, degrees F	55°	55°
Steam pressure, lbs	63	59
Hot gases, carbonic acid, p. c.	15.0	12.6
Temperature, degrees F	394	403
Evaporation, lbs. water per lb coal	8.03	7.14
Ditto reduced to steam at 212° and water at 32° F	8.06	7.16
Ditto per sq ft. heating surface per hour	4.1	3.2
Efficiency, per cent. of total heating power of coal	76.2	67.6

Donneley firing 12.7 per cent. ahead in evaporation and 27.4 per cent ahead in steam production per square foot of heating surface. Neither boiler produced smoke. The anthracite clinker stuck to the grate bars, and in the horizontal grate was so difficult to remove as somewhat to impair the steam production.

Fourth experiment: Brown coal (lignite). Composition: carbon, 30.8; hydrogen, 2.34; oxygen, sulphur and nitrogen, 12.16; water, 44·65; ash, 10.05.

Results of Experiment.

	Donneley.	Horizontal Grate.
Length of trial, hours	8¾	4
Coal burned, lbs	9,508	5.544
" " per hour, per sq. ft. of grate	56	52
Water evaporated, lbs	24 908	13,105
Temperature feed water degrees F	54	54
Steam pressure, lbs	65	68
Hot gases, carbonic acid, per cent.	15 9	12.5
Temperature, degrees F	500	396
Evaporation, lbs water per lb coal	2.62	2.36
Ditto reduced to steam at 212°, water at 32°	2.62	2.35
Ditto per sq. ft. heating surface, per hour	3.8	4.4
Efficiency, per cent. total heating power of coal	68.6	61.3

The Donneley firing evaporated 12 per cent. more water per pound of coal, but produced 13.2 per cent. less steam per unit of heating surface.

These experiments were so carefully and systematically carried out and by such impartial authorities that it has seemed desirable to give the results in detail, particularly as they establish the economy of what appears to be a really practicable and remarkably convenient system of continuous firing, which might be applied to locomotives as well as to stationary boilers. Herr Schneider makes no observation as to the form or size of the hopper inlet, but it would seem as if the hopper might be with advantage extended upward a little in order to give more coal storage space above the actual fire, particularly as Herr Schneider states that it is important to keep the hopper always full in order to prevent the passage of air into the combustion chamber from this opening. With a suitably formed hopper a more satisfactory burning of shavings either with or without coal intermixture could be had than has been hitherto practicable.

The Milling Machine as a Substitute for the Planer in Machine Construction.*

Finishing surfaces by rotary cutters, or, in machine shop vernacular, milling, has not received the attention from mechanical and proprietors of machine and tool factories which it deserves. There appears now, however, an awakening among engineers to the importance of using the milling machine as a substitute for the planer, and it is safe to prophesy that the places of the two machines will be reversed, and the planer become the jobbing tool, instead of the milling machine as now. * * *

There is no reason why the milling machine should not be used to finish the various parts of machine tools, locomotive, or stationary engines and other large machinery. It may be asserted that there is no part of a locomotive now finished on the planer which cannot be done on the milling machine, if properly designed for such work, and at a cost of from one half to one tenth, besides, in most cases, producing far better work and nearer to interchangeability.

In conversation with master mechanics, superintendents of shops, and others interested in such matters, the reason given for not using the milling machine has been the cost for cutters, and in return the answer should be that milling cutters are not as expensive as the single pointed planer tool, to produce a given amount of work. This is known from an experiment made by myself, which was as follows, and although not absolutely correct, is sufficiently so to make the relative cost of producing work on the planer and milling machine, obviously in favor of the latter.

One hundred pieces of cast-iron 16 in. long, large enough to finish 1½ in. by 1 in., used for lathe racks, were given to the man in charge of the milling machine, and an equal number of the same pieces, to the man in charge of the planers. The cutter used on the milling machine was simply a plain, spiral cutter, of 2¼ in. diameter by 2 in. in length, costing to make in the shop, including stock, labor, and shop expenses, two dollars and ten cents. This cutter was sharpened but once, and that, after the completion of the job, which consisted in roughing the four sides of the 100 pieces. The periphery speed of the cutter was 26 ft. per minute, and the feed 3⅛ in. per minute; time consumed, 44 hours, 39 minutes. Two milling machines were used—one each for roughing and one for finishing cuts. The cutters required grinding at the end of the job, and so were chargeable to it; the time required to grind them was 22 minutes. The wages of boy running the machine was 9 cents per hour. The total cost for finishing the 100 pieces on the milling machine was as follows:

44 hours, 39 minutes at 4¼ cents each, per hour	$3.99
Sharpening cutters, 22 minutes at 30 cents per hour	.11
Shop expenses at 35 per cent. of labor	1.39
Total cost	$5.49

The cost of the same number of pieces finished on the planer was as follows:

The platens of the planers used ran 24 ft. per minute cutting speed; return 2 to 1; the feed was as coarse as could be used on the roughing cut—that is, about 22 per in. Time consumed on each planer, 25 hours 46 minutes; wages of man running the planer was 25 cents per hour. The total cost for finishing the 100 pieces on the planer was as follows:

24 hours 35 minutes each machine, at 25 cents per hour	$6.03
Grinding and setting tool 19 times, 1 hour 21 minutes	.33
Shop expenses, 35 per cent.	2.22
Total cost	$8.58
Balance in favor of milling machine	3.09

This, you will bear in mind, is showing the planer to its best, and the milling machine to its worst advantage. Where the milling machine makes the best showing is in irregular work, which in the planer requires the constant attendance of the workman—such as planing close to shoulders, cutting bevels and T slots, and jobs of a similar nature.

The advantage of the milling machine is then seen, as the cost for attendance is, often, not one-tenth, owing to the fact that a much cheaper workman can run several machines. The cost of tools in each case was as follows:

Milling cutters, first cost, $2.10 each	$4.20
Grinding once, 22 minutes	.11
Total cost	$4.31
Planer tools, first cost, 42 cents	.84
Re-dressing by smith, once	.16
Grinding and setting roughing tools 19 times, 1 hour 21 minutes	.33
Grinding and setting finishing tools 6 times	.10
Total cost	$1.43
Expense of keeping tools in order on milling machine	.11
And for planer	.59
Balance in favor of milling machine	.48

This does not include the time of workman's loafing in the smith shop, this trouble being entirely done away with in the milling cutter. The milling tools after this trial showed no perceptible wear, or difference in size, and it is safe to say that they would finish fifty such lots of 100 pieces. The cost for tools in that case would be about as follows:

Milling machines, first cost	$4.20
Grinding 50 times at 11 cents	5.50
Total cost	$9.70
Planer tools, first cost	.84
Re-dressing roughing tools 50 times at 16 cents	8.00
Grinding and setting 950 times at 1 72-100 cents	16.43
Finishing tool 10 times at 16 cents	1.60
Grinding 300 times at 1 72-100 cents	5.19
Total cost	$32.06
Balance in favor of milling tools	22.36

This calculation on the life of milling cutters is based on what has actually been done in the American Sewing Machine Co.'s Works, where I now have charge. Since Feb. 15 of this year, up to the present writing—Sept. 14—there has been finished by one set of cutters about 15,000 sewing machine beds, the cut being about 6 in. long. These cutters have been ground but five times and show but a very little reduction in size. Common sense teaches that a continuous rotary cutting motion will produce more work than a reciprocating or intermittent one. If inventors would turn their attention to the further development of the milling

* A Paper by John J. Grant, Philadelphia, Pa., presented at the XVIth Meeting, Philadelphia, 1887, American Society of Mechanical Engineers.

machine, for general machine work, instead of the quick return of planers, they would benefit themselves and be doing the mechanical world better service. Some of our large machine and tool builders are using the milling machine to their great advantage. The following may be mentioned who, to my knowledge, are using regular and specially designed milling machines to their profit: Brown & Sharpe Manufacturing Co., the Pratt & Whitney Co., the Baldwin Locomotive Works, the Straight Line Engine Works, and others. * * *

In the construction of machine tools it is possible to mill every part of an engine lathe, a great part with common straight cutters and the balance with special ones. Modern cutter grinding machines, with their attachments, have made it possible to keep cutters sharp and in perfect shape, so that the old and expensive methods of grinding by hand, or annealing and working over, need not be resorted to, and modern ideas of the sizes of cutters necessary to do work, make their first cost much less. A cutter of 2 in. to 2½ in. is now used where formerly it was thought necessary to use one of from 4 to 6 in. diameter.

The field of regular and special milling machines for small work, being pretty well worked over, what is wanted is more special machines and fixtures, built for and adapted to the finishing of parts of such machinery and tools as are now finished on the planer.

In the shop at Flushing, Long Island, with which I was formerly connected, milling machines and special milling fixtures were adapted for nearly every part of the 14 inches swing engine lathe. The only part of this lathe not milled was the bed and a small part of the carriage, and this was under consideration when the partnership was dissolved. * * * A man employed in the shop offered to finish 6 ft. 14 in. lathe beds for 60 cents each, if I would build for him a milling machine such as had been sketched out. We were at that time paying $3.00 each for planing them.

The Pratt & Whitney Co. are considering the feasibility of constructing a milling machine for this purpose. The Putman Machine Co., of Fitchburg, Mass., have, acting upon my advice, made a milling fixture for an 84-in. square planer, for facing up the ends of planer and lathe beds when it is necessary to join them together. This arrangement works perfectly, the ends being milled off before the bed is removed from the planer platen. When bolted together the two pieces are as near a true plane as it is possible to make such work, while the time consumed was less than it would take to remove the bed and place it crosswise on the planer platen. * * * A large special milling machine has just been finished for use in the Straight Line Engine shop at Syracuse, N. Y. In a communication received from the President of the Company a short time since, he mentioned the fact that the machine was just completed and he was at that time engaged in milling out the T-slots for bolt ways in the platen, which was being accomplished at the rate of 2 in. per minute. The Ferracute Machine Co., of Bridgeton, N. J., are constructing an immense milling machine for their own use.

The advantages of the milling machine over the planer are many, among which are the following: Exact duplication of work; rapidity of production—the cutting being continuous; reduced cost of production, as several machines can be operated by one unskilled workman; and, reduced cost of tools for producing a given amount of work.

It is not possible in a short paper to show more than a few of the advantages, but if an interest is awakened in the possibilities of the milling machine, in cheapening the cost of machine work of all descriptions, the object of this paper will be accomplished.

The Proper Design for a Hoop Joint for a Water Tank.

BY J. B. JOHNSON.

There are two kinds of lug joints in common use for hoops on wooden water tanks. One is made with cast-iron lugs riveted to the hoop bar, and drawn together by bolts. The other is a wrought-iron lug made by bending a thicker plate, as shown in Fig. 2, and riveting in it to the hoop. Both of these are very bad designs, for the following reasons:

1. In both cases the plane of the bolts is removed nearly two inches from the plane of the hoop, thus giving rise to a bending moment, which will be likely to either break the casting or shear the rivets, or bend down the lug in case it is wrought iron.

2. Any distortion of the angle of the lug from its normal position necessarily bends the bolts and so diminishes their strength, as shown in Fig. 2.

3. The riveting of the lug to the plate weakens the plate by reducing its available section.

4. These joints cannot be computed for strength, and hence there is a large element of uncertainty in them, unless many of them are actually tested in a machine.

The writer has recently had occasion to investigate this subject experimentally, and with the following results:

Results of Tests.

Size of plates, 4 in. × ¼ in.; size of bolts, ⅞ in. diameter, not upset; lugs made of 4 in. × ½-in. plates; lugs held by six ⅝-in. rivets (fig. 2); one bolt to a joint.

When placed in the machine the hoops were held in place by a bearing shaped to the curve of the tank, which was of 10 ft. radius. The pull was thus made tangential to a circle of that size, just as it is in practice.

The strength of the hoop, tested alone, was 53,350 lbs. (mean of two tests).

The strength of the bolts, tested straight, was 23,200 lbs. (mean of eight tests).

The reduced area of the bolts was but 0.43 sq. in., thus giving an average strength of iron in the bolts of 54,000 lbs. per sq. in.

The strength of the bolts in the joint test and when bent, as shown in fig. 2, was but 13,350 lbs. (mean of two bolts) or 31,000 lbs. per sq. in. The iron in these bolts and hoops, however, was not very ductile, the elongation being but 9 per cent., and the reduction of area but 8 per cent. on straight tests (mean of three).

The lugs bent over and cracked widely at *a*, fig. 2, at a load of 10,000 lbs., but no final rupture occurred at this point. Rupture occurred either by breaking the bolts or by shearing the four rivets back of the lug, shown at *b*, fig. 2, two cases of each, the mean strength of bolts being 13,350 lbs., and the mean strength of rivets (four ⅝ in. diam.) being 16,100 lbs.

In the joints tested, which were taken from an actual structure, the strengths of the bolts were but 32 per cent. and of the lugs but 42 per cent. of the strength of the *net section* of the hoop. No cast-iron lugs were tested, but the great uncertainty as to the strength of structural castings would make tests practically valueless for computing the strength of *other* castings, so that these should be ruled out on general principles, and they are, I believe, now seldom used.

A New Design.

In fig. 1 is shown a design for such a joint, which the writer believes to be simpler and more easily constructed than the lug joints, and at the same time far more reliable and strong. It will be as strong as the bolts used, and may be made very much stronger than the body of the bar. Furthermore, if the lap is welded, the hoop-section is not

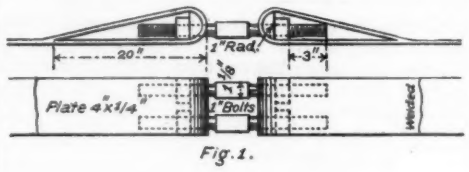


Fig. 1.

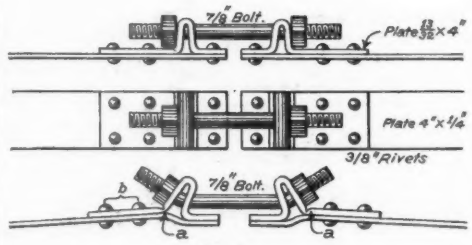


Fig. 2.

diminished by rivet-holes, and so the full strength of the hoop may be relied on in designing the tank.

Here the bolts are pulled straight, and so their strength can be determined with certainty. The hoops are bent about a circular mandrel, and a flat-round cast-iron bar used for a bearing plate inside. The nuts are prevented from turning by setting the bars so low that the nuts rest flat on the lower plate. The rods are upset in the middle and made square, and fitted with right and left threads and nuts. The wrench is then applied to the bolt, which acts like a turnbuckle. By making the radius of the curve of the loop larger, or the loop longer, greater latitude will be given for the ends of the bolts, and so a greater compass of joint obtained. Or long oval-shaped holes could be cut in the plates, permitting the bolts to pass through if desired.

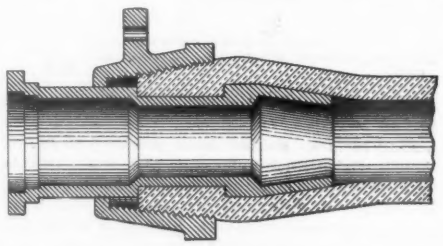
This joint can be computed with certainty, whereas no lug joint can be. It is a better appearing joint than a lug joint, and one which can readily be made to develop the full strength of the hoop. The rule for strength would be to make the total net area of rods (area on threads) some 15 per cent. more than the net area of the hoop.

The lap joint might be riveted, if preferred, and this would probably be done provided the splice joints in the hoop are riveted, in which case the usual rules for single lap riveted joints would held.

Gold's Hose Clamp for Continuous Heating.

The form of hose clamp shown in the accompanying engraving has been adopted by Mr. Edward E. Gold, for use in connection with his system of heating.

It need hardly be pointed out that it is a difficult matter to secure rubber hose firmly and permanently when a high pressure of air or water is used, and this difficulty is increased when the hose is not only stretched by the pressure, but is softened by the heat and moisture of steam.



In the clamp shown, a tapered union is screwed directly on the rubber and forces it on the nipple. It will be apparent that it is practically impossible for the hose to be blown off the nipple. It might be thought that the screw threads would cut the rubber, but hose that have been in actual use for some time show no marks of this action, the screw threads merely slightly marking the hose without cutting it.

Experiments on the Strength of Compression Members.*

The use of steel in the construction of the Susquehanna River bridge on the Philadelphia branch of the Baltimore & Ohio Railroad, and the lack of data relative to the strength of full size steel compression members, led to experiments which are the subject of this paper, and which were made by direction of the Chief Engineer.

*By James G Dagron, Member American Society of Civil Engineers. Presented at the Convention of the Society, July 1, 1887.

The specifications for the steel to be used, in compression members for this bridge, were as follows: "Steel used in compression members shall be open hearth, and shall not contain more than 0.1 per cent. of phosphorus. A sample bar ¾ in. in diameter shall bend 180 degrees around its own diameter without showing crack or flaw, and when tested it shall have an ultimate strength of not less than 80,000 lbs. per sq. in., and an elastic limit of not less than 50,000 lbs.; and shall elongate at least 15 per cent. in 8 in., and show a reduction of area of at least 30 per cent. at point of fracture." Although the specifications excluded Bessemer steel, it was afterwards decided to use it and the columns were constructed of steel made by that process. The steel used was made by the Pittsburgh Bessemer Steel Company, at their works at Homestead, near Pittsburgh, and was rolled by the Union Iron Mills, Pittsburgh.

The columns were constructed at the shops of the Keystone Bridge Company, Pittsburgh, contractors for the superstructure of this bridge.

The formulas specified for the allowable maximum stresses in steel compression members whose length exceeded sixteen times their least diameter, were as follows:

For posts with square bearings..... $\frac{P}{S} = \frac{11{,}000}{1 + \frac{l^2}{36{,}000r^2}}$

For posts with one pin and one square bearing..... $\frac{P}{S} = \frac{11{,}000}{1 + \frac{l^2}{24{,}000r^2}}$

For posts with pin bearings..... $\frac{P}{S} = \frac{11{,}000}{1 + \frac{l^2}{18{,}000r^2}}$

l representing the length of posts in inches and r the least radius of gyration of the section.

These formulas are an adaptation of Rankine's well-known

$$\frac{P}{S} = \frac{f}{1 + \frac{l^2}{ar^2}}$$

formula in which:

P = Ultimate load in pounds producing the crushing or bending of the columns.

S = Sectional area of columns in square inches.

f = Constant, supposed to be equal to the ultimate resistance per sq. in. of a short column whose length is equal to its diameter.

a = Constant, varying with the conditions of the end-bearings of the columns.

In the present case the constaut f was assumed equal to 55,000 lbs. instead of 40,000, which is generally used by American engineers in the case of wrought-iron, and it was hoped that the results of the experiments would justify this assumption.

The columns tested were eight in number, and were of the following lengths between pier centres, viz.: 16 ft., 20 ft., 24 ft., and 25 ft. 7½ in., two columns of each length being experimented upon. The six shortest columns were made up, as follows:

4 angles 2¼ × 2¼ × ¼ in.....	= 4.24 sq. in.
2 plates 8 × 8¼ in.....	= 4.00 "
	8.24 "

The two longest columns were composed of the following sections:

4 angles 2⅜ × 2⅜ × ⅝ in.....	= 6.48 sq. in.
2 plates 9 × ⅝ in.....	= 6.75 "
	13.23 "

The rivets used were of soft steel, and were ⅞ in. in diameter, and were power-driven.

The columns were crippled under pressure in a hydraulic press at the shops of the Keystone Bridge Co. In all the experiments the columns were placed horizontally in the press, without any intermediate guide or support, being counterbalanced at the centre by one-half their weight. The pins in all cases were placed in a horizontal position. The pressure, which was recorded by a mercurial gauge, was applied by increments of about 1,000 lbs. per square inch of sectional area of the two largest columns, and of about 1,575 lbs. per square inch of sectional area of the six smaller columns, and completely released between each application. The vertical and horizontal deflection, and the compression of the column under each application of pressure, and its permanent deformation after each release, were carefully measured.

The apparatus used in measuring the compression is fully described in the paper on "The Strength of Wrought-Iron Columns," by Mr. G. Bouscaren, M. Am. Soc. C. E., Transactions, Vol IX., page 449, and is shown on Plate No. 29, accompanying that paper.

The steel made for the experimental columns was of the following chemical composition:

	Carbon.	Manganese.	Phosphorus.
Blow 8,845	.26	.79	.067
Blow 8,847	.27	.83	.067

and when tested in ¾-in. rounds rolled from a 4-in. ingot it gave the following results:

	Blow 8845.		Blow 8847.	
Elastic limit in pounds per sq. in.	51,190	53,890	53 140	53,150
Ultimate strength, " "	84,440	84,750	83,680	83,760
Elongation in 8 in. per cent	18.75	18.75	20.75	20.25
Reduction of area per cent	33.23	30.55	37.78	39.74

the fractures showing a fine grade of material. The test rounds were not annealed, and were tested in the condition in which they left the rolls. No tests were made on the finished material.

The columns failed as follows:

No. 1. Failed by bending downwards at rivet in latticing, 1 ft. 10½ in. from the centre, buckling flange angles and web plate.

No. 2. Failed by bending upwards at rivet in latticing at centre, buckling flange angles and web plate. One angle was fractured at point of buckling, and also at the two adjacent rivets in latticing.

No. 3. Failed by bending upwards between latticing, 3 ft. from centre, buckling web plate and flange angles.

No. 4. Failed by bending upward between latticing, 4 in. from centre, buckling flange angles and web plate failing.

No. 5. Failed by bending upward between latticing, 9½ in. from centre, buckling flange angles and web plate.

No. 6. Failed by bending upward between latticing, 1 ft. 5¾ in. from centre, buckling flange angles and web plate.

No. 7. Failed by bending upward at rivet in latticing, 3 in. from centre, buckling flange angles and web plate.

No. 8. Failed by bending upward at rivet in latticing, 1 ft from centre, buckling flange angle and web plate.

The results obtained are given by the accompanying table.

No. of column.	Depth. Inches.	Sectional area. Sq. in.	Length centre to centre pin-holes ft.	in.	Ratio of length to radius of gyration.	Square of radius of gyration.	Ultimate strength in pounds per sq. in.	Modulus of elasticity. Pounds.
1	8	8.24	16	0	42.05	20.86	41,020	27,705,000
2	8	8.24	16	0	42.05	20.86	41,650	27,705,000
3	8	8.24	20	0	52.564	20.86	39,440	26,113,000
4	8	8.24	20	0	52.564	20.86	41 650	25,816.000
5	8	8.24	24	0	63.075	20.86	40,230	29 504.000
6	8	8.24	24	0	63 075	20.86	40,070	28,398,000
7	9	13.23	25	7½	58.795	27.34	35,570	26,557,000
8	9	13.23	25	7½	58.795	27.34	38,81o	29 478,000

In every case, after test, the rivets of each column were found, by hammer test, to be perfectly tight.

The comparison between the ultimate resistances obtained, and those corresponding to the formula is given by the following table :

No. of column.	Ultimate strength in pounds per square inch. Formula.	Actual.	Ratio of actual to calculated strength.
1	50 080	41 020	81.90
2	50 080	41 650	83.16
3	47 680	39 440	82.50
4	47 680	41 650	87.34
5	45 050	40 230	89 30
6	45 050	40 070	88.95
7	44 060	35 570	79.11
8	44 060	38 810	86.32

The values of the constant f derived from the experiments are as follows :

No.	f =		
1	45 050		
2	45 740		
3	45 490		
4	48 040		
5	49 120		
6	48 920	Average	= 47 060
7	43 510		
8	47 480	Average	= 45 495
		General average	= 46 670

The general average for the eight columns was, therefore, 15.15 per cent. less than the value assumed for f in the specification formulas.

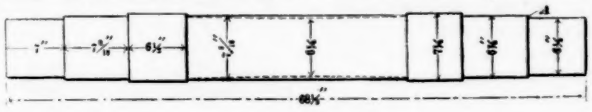
The results obtained in these tests show that Rankine's formula cannot be used for steel columns in its present form, by simply allowing an increase of load of 37½ per cent. for steel over iron compression members. If this formula is to apply, new numeral co-efficients will have to be determined by a much greater range of experiments than those covered by the present paper, and it may then be found that in the law governing the flexure of steel columns of a given grade of material, increasing in length, the lateral stiffness of the material may become a factor of increasing importance in determining the stability of the column, as has been stated by Mr. James Christie, M. Am. Soc. C. E., in his valuable paper on "The Strength and Elasticity of Structural Steel," in Transactions, Vol. XIII., August, 1884.

These experiments may prove of some value to the profession, and lead some large steel manufacturing and bridge building concerns to undertake a thorough series of investigations on the strength of full-sized steel compression members. The series of tests should embrace a certain number of columns of each length, with different grades of steel, increasing in carbon percentages, with constant manganese percentage, and low in phosphorus, so that it might be determined which grade of steel gives the best results consistent with safety. Such a series of experiments would no doubt result in a more general use of steel for structural purposes, as engineers would then be better able to properly proportion structures to be built of a metal whose one great advantage, aside from its increased strength, is that it permits the different parts of the structure to be built with different grades of material corresponding to the strains which occur in them.

Broken Steel Axle.

The accompanying engraving and letter, which we take from the *American Machinist*, emphasizes the danger of cutting sharp shoulders on steel axles. The excellence of the material is shown by its long endurance, but if the axles had been properly proportioned, and easy fillets introduced at every change of diameter, the axle would probably be running yet.

"I inclose sketch of two that have been taken out of engines with 16 in. × 24 in. cylinder, 48 in. boiler here within three weeks. Each or them broke at the end of the wheel fit marked *A*, and the wheels were left by the roadside. Both were forward axles, and there was only a small portion of the centre of each that held at the time of dropping off, the outsides of the brake having rubbed together until they were smooth. They were both cast-steel of a well known make. One had run about twelve years, most of the time on heavy freight work, and the other about five years on heavy passenger work.



Broken Steel Axle.

"I believe that if the middle part of those axles had been cut down to the dotted lines in the sketch, and the shoulders at *A* been round instead of square, those axles would have been running now, but there is evidently a difference of opinion, as they were replaced with more of the same kind, which, by the way, are put into all sizes of engines, from 14 in. × 22 in. cylinder and 44 in. boiler to 16½ in. × 24 in. cylinder and 50 in. boiler. E. W. COMSTOCK."

As long as this difference of opinion and method of proportioning driving axles exists, so long will axles continue to break and leave wheels by the roadside.

TECHNICAL.

Locomotive Building.

The Mexican Central has ordered 7 freight locomotives of the Baldwin Locomotive Works, 2 to be delivered in January, 2 in February and the rest in March. This is in addition to 12 locomotives previously ordered to be delivered in March.

The New York, Lake Erie & Western road has placed an order with the Hinckley Locomotive Works of Boston, Mass., for the construction of 10 six-wheel switching engines, which are are to weigh 95,000 lbs. each.

H. K. Porter & Co., Pittsburgh, Pa., locomotive manufacturers, have suspended one-third of their employés on account of a lack of orders. When trade improves the men will be given their old positions.

It is reported that Messrs. Dubs, a Scotch firm of locomotive builders having works in Glasgow, have taken over the Canadian Locomotive Works at Kingston, Ont., and will shortly commence building at Kingston 100 locomotives for the Canadian Pacific.

The Car Shops.

The Allegheny Valley has given an order for 125 gondola cars to Billemeyer & Small, York, Pa. The latter company is also building 14 passenger cars of the Pennsylvania Railroad standard for the Norfolk & Western, these to be equipped with the new Frost carburetter light.

The Terre Haute Car Works are building 300 furniture cars for the Chicago, Milwaukee & St. Paul. They are 6 ft. longer than ordinary box cars and 9 ft. high in the clear. It is said that the Chicago, Milwaukee & St. Paul will send these cars into Indiana, and make an effort to secure some of the business of this character.

An 80-ton flat car, the largest ever constructed in this country, is building at the Lehigh Valley shops, at Packerton, Pa., for the purpose of hauling a piece of machinery from New York to Bethlehem.

Manufacturing and Business.

The Union Bridge Co., Athens, Pa., has ordered of the Clayton Air Compressor Works, New York, one of their air compressors, with the patent air pressure governor.

An officer of the Boston & Albany is authority for the statement that during the past year the entire cost of repairs of the Dunham storm-proof doors on 1,000 freight cars did not exceed $5 for the entire year.

The Lorain Manufacturing Co., of Lorain, O., are receiving bids for an iron foundry building to be T-shaped, each arm 170 × 100 feet, to be completed May 1, 1888.

Pedrick & Ayer, Philadelphia, have bought a lot 40 by 100 ft. near their present works, and intend in the near future to build a new two-story shop. They have lately put in a Belden steam hammer, a Currier & Snyder 36-in. drill, and have attached a Pratt & Whitney turret head to one of their lathes. They have also built one of their own heavy milling machines for use in their shop.

C. & G. Cooper & Co., of Mt. Vernon, O., report sales of Corliss engines aggregating over 2,000 horse-power.

Iron and Steel.

The Tallapoosa Malleable Iron Works have been organized at Tallapoosa, Ga., with N. N. Lind as President, John F. Lang Secretary, Superintendent and General Manager, and Joseph Landgren Treasurer.

All remaining employés at the Edgar Thomson Steel Works, of Pittsburgh, Pa., will be suspended this week, and the works will probably be closed for some time.

The plate department at the National Rolling Mill, at McKeesport, Pa., suspended last week for several weeks, during which time an entire new foundation will be put under the mill, and it will be prepared to work the great plates from which the 24-in. pipe will be welded. The department will hardly resume within the next month, and 200 men will be idle in the meantime.

The new rolling mill at Bowling Green, O., which was demolished by a severe wind storm Oct. 22, is being rebuilt, but, owing to the accident, the works will not be ready to start as early as was anticipated. The company has been donated a site of nine acres of ground, and the city of Bowling Green agrees to furnish it with natural gas free of charge.

The Stevens & Brace Iron Co.'s works, in Kansas City, Mo., were burned this week. Loss on buildings, $25,000, fully insured; on contents, $80,000; insurance, $60,000. The building was owned by Charles Francis Adams, of Boston.

The St. Louis Malleable Iron Works, which have been idle nearly three months, are to be utilized for the production of steel castings, and the company controlling these works is to be reorganized to that end.

The Youngstown, (O.) Rolling Mill Co. has elected John H. Welsh Treasurer and Mr. John M. Evans Secretary. This action was taken in view of the resignation of Mr. Henry Wick, who was Secretary, Treasurer and General Manager. Mr. Wick will take charge of the Alderdice, Bishop & Co. mill, at Warren, under an arrangement with the creditors.

The Suez Canal.

The improvements made during the last few years in marine engines and the consequent economy in coal seem to have unfavorably affected the traffic through the Suez Canal. This appears to be the only cause of the decreased traffic through the canal as shown by official figures. The decrease has been slight but steady every year since 1884. As the commercial conditions have not shown any unusual depression, and as the total number of ships afloat and their tonnage has not decreased, the unfavorable showing made by the earnings of the Suez Canal is accounted for by the competition which the old Cape route has been able to make. Steamers provided with triple expansion engines can make the whole voyage from Europe to India around the Cape of Good Hope without having to stop at coaling stations, and so can save valuable time, while the saving of time in the shorter voyage by Suez is compensated on the other route by the saving of the heavy canal tolls. The tolls for the passage of a steamer of 3,000 tons through the Suez Canal are equal to the approximate price of the same weight of coal in England. The passage down the Red Sea is not only very trying to the firemen, owing to the intense heat, but the navigation is very dangerous, the rocks and reefs being numerous and insufficiently lighted. These disadvantages have always militated against the Suez route, while the delays and risks of grounding in the canal are also drawbacks which are felt more acutely as the size of ships and the volume of traffic increases. The canal is to be widened and deepened, but should this decrease in traffic continue the company will be forced to lower the tolls.

Purifying Feed-water.

The Philadelphia & Reading is experimenting in the Mahanoy Valley with a series of reservoirs and lime treatment in an attempt to utilized the water pumped from the coal mines, for boiler feeding and also for domestic purposes. The experiments so far promise to successfully remove the objectionable acids.

Non-Magnetic Watches.

Watches made entirely of metals which are not affected by magnetism are now made by the American Waltham Watch Co., of Waltham, Mass. The manufacturers assert that the watches "are accurately adjusted and possess all the fine time-keeping qualities characteristic of Waltham watches."

The Peekskill Bridge.

Work was recently begun on the proposed bridge across the Hudson River from Anthony's Nose to Fort Clinton, just above Peekskill. This is to be a suspended girder bridge 195 ft. above tidewater at the towers. It will be 2,700 ft. from anchor to anchor and from tower to tower the span will be about 1,680 ft. The charter under which this work is conducted is one granted about 18 years ago, to what was called the Hudson Highland Suspension Bridge Co., the name of which was afterward changed to the Hudson Suspension Bridge & New England Co. It is intended to build a double track road across the bridge. The company also proposes to construct, on the west side of the river, a road from Turners, on the New York, Lake Erie & Western, to the bridge, a distance of 14 miles, and also to build from the northern terminus of the New Jersey & New York road to a point intersecting the line from Turners, a distance of 8 miles. This will give connections with all the roads running out of Jersey City. On the east of the river it is intended to build to the Connecticut state line, a distance of 28 miles, connecting with the New York Central & Hudson River, the New York & New England and the New York, New Haven & Hartford. General Serrell is President of this company; William D. Snow, for many years Secretary of the American Loan & Trust Co., has been made Treasurer of the organization. The company announces its intention of having the bridge finished within 20 months from now.

Foreign Guns for Belgium.

The question of going outside of one's own country to order cannon has excited some interest and indignation in Belgium as well as in the United States. The legislative branch of the government has given the Ministry a vote of confidence in the matter of orders for artillery, and the *Moniteur Industriel* considers that the result will be an order from Krupp for 20 field pieces, and further orders for heavy guns may also be sent there. The Belgian government has insisted that the manufacturers of Belgium were not in a position to compete with Krupp. This allegation the *Moniteur* denounces as absolutely false, and states that, as regards quality of metal, the Belgian works, and especially the Cockerill Company, can produce gun steel in all respects equal to that of Krupp, and it adds that if there is still any interiority in the product of the Belgian works it is the fault of the government, which has persisted in placing its orders for artillery abroad.

Tank Cars for Carrying Wine.

The Southern Railroad Co., of Italy, has proposed to the Royal Directors a design for a tank car for transporting wine. The model has been carefully devised by the officers of the company, with a view to developing as much as possible the transportation of wine on the Adriatic system. The car is of iron, covered with wood, to lessen the variations of temperature, and will carry about 12 tons—that is, about 14 cubic metres. It is provided with a pump and cocks, placed conveniently, as well as a safety valve for the escape of gas generated by the wine in transit. It is estimated that the car will cost about $1,300.

American Type Locomotives in Italy.

A locomotive has just been built in the shops of the Adriatic system at Florence, Italy, which is the first of a number to be built for the Southern Railroad Co., to run on the line from Milan to Rome. This locomotive was designed in the shops of the company by Chevalier Riva, Engineer of Motive Power, and it is said to have been made to conform very closely to the most modern American type. The weight of the locomotive in working order will be 101,000 lbs., 64,000 lbs. of which are on the drivers. The total length is 33 ft., and the total wheel-base about 23 ft. The weight of the tender in working order will be about 66,000 lbs. The engine has been designed for a maximum speed of 55 miles an hour.

Recent German Tests of Aluminum and Magnesium.

Comparative tests of these two metals were lately made at the laboratory of the Berlin-Charlottenburg High School.

The physical properties determined were :

	Aluminum.	Magnesium.
Specific gravity	2.67	1.75
Tensile strength, lbs. per sq. in.	271 to 286	351
Expansion per cent.	2.5	1.0

Magnesium can be best worked when heated to 212° F. at which temperature it can be easily pressed, rolled and drawn. More difficulty is encountered with this metal when casting it or soldering, as the melting point and the burning point are only a few degrees apart, and the loss by oxidation large. The molten metal does not fill the molds so perfectly as aluminum, and the castings obtained are almost always rough surfaced and have air holes. The difficulty in soldering magnesium comes from the fact that it cannot be easily kept free from oxidizing, and even the slightest layer of oxide renders the soldering more difficult. But the same difficulty it also encountered, and has not yet been wholly surmounted in the case of aluminum. As regards their being affected by atmospheric influences the two metals show little dissimilarity, provided the magnesium is very pure. Magnesium can be easily worked on the lathe. It can be engraved and polished, and rolled in complicated sections. The alloys of magnesium are of a beautiful brightness and fine color, but are easily affected by atmospheric influences and are brittle, so that they are ill adapted for technical purposes. A large field of usefulness would be open to magnesium in the industries if a method could be found for covering it with other metals, such as copper, silver, etc., by the galvanic process. Its great strength, low price and lightness would render it capable of many applications in place of brass, white metal, etc.

Tri-Sodium Phosphate, a Water Purifier.

The American Institute, at their fifty-sixth National Exhibition, have given the Medal of Superiority to this compound, exhibited by Messrs. Wilson & Roake, the New York agents of the Keystone Chemical Co., of Philadelphia. The judges stated in regard to it, that "This exhibit is a tribasic phosphate of soda. It unites with the mineral acids in combination in boiling water, not only breaking up the scale producing salts, but converts them into insoluble non-corrosive precipitates readily eliminated. It is not simply a solvent for scales, but direct chemical action converts them into inert and easily removable bodies. It is also free from injurious action."

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The report of Pacific Railroad Commission, which is summarized on another page, is an exhaustive exposition of the condition and relations of the original transcontinental roads, and it makes recommendations which are positive and clearly put. The Union Pacific is decided to be solvent and (since 1884) well managed, but the others are denounced in severe terms. The waste of vast sums of the money of the Eastern system previous to 1884 is charged against Jay Gould, and similar accusations are made against the four prominent men in the Central Pacific management. Commissioner Pattison, in a minority report, goes further than the other members, recommending severe punishment of all officers of the roads who have misapplied funds and the annulment of the charters of the road. The discussion of this report in Congress should give legislators and people a clearer idea of the status of these roads and their relations to the government than has heretofore been had.

Butting collisions, entailing fatal results, are worthy of attention whether they occur once a year or thrice a day; the record of American railroading will be discreditable—and disgraceful, as well—so long as there are *any* of them. We therefore give space this week to another lesson from Massachusetts. There are numerous warnings to be derived from this collision, but they need not be enlarged upon. Railroad men will ask why this "general agent," unprovided with electrical communication, was allowed to control trains, instead of having all orders issue from the dispatcher's office; and also, why verbal orders, approved by only one man, are permitted in this enlightened day to take the place of written orders, surrounded by proper safeguards. Satisfactory settlement of a few questions like these will obviate all danger of collisions from *this* cause, at least. The managers of the road can see how the dropping of a single stitch—the discontinuance of telephones a little too soon—aided in producing a fatal result, and the engineman and conductor can see that intelligent compliance with the rules, especially that one which requires doubtful questions to be always decided in one way, and which the Massachusetts commissioners have lately emphasized, may involve the refusal to obey a superior and even the risk of one's position. Hazy ideas as to whom he should obey in a crisis, doubtless, led the engineman into this error. The idea that it is safe to "run slow around curves," when one has no right on the curve at any speed, was exploded on the western prairies years ago; but men still put faith in it, even where the conditions are not nearly so favorable as they are on the open prairie.

On another page will be found a letter concerning the care of passengers' property in sleeping cars. It was pointed out in the *Railroad Gazette* of July 29, 1887, that it is now a pretty well settled rule of law that a sleeping car company is not an insurer of the valuables of its passengers, but that it is bound to take reasonable care against losses and theft. It becomes a question in any given case for a jury to decide whether or not reasonable care has been taken. In the event of a suit to recover for loss of valuables, it is of the greatest importance for the company to be able to show that its cars were manned by a sufficient number of trusty conductors and porters, and that reasonable precautions were taken. Could the company also show that it had a safe for the deposit of valuables, and that passengers were informed of the fact, a jury would ordinarily, no doubt, take this additional precaution into consideration to the advantage of the company. We do not learn that any device of the kind has ever been tried, but the experiment might be worth making. A fire-proof safe is not called for. Twenty small steel drawers would not take up much room or add serious weight. The passenger who wished to use one of them could take the key; or the drawers could be provided with combination locks.

In the annual report of the Commissioner of Railroads for the state of Michigan, of which we give some account in another column, there is some attempt at analysis of railroad accounts which, though not correct in its details, nevertheless draws attention to a practice which might advantageously be changed. We refer to the habit of including in the income account of each year the aggregate balance surplus or deficit from the income accounts of past years. As long as this practice is understood by all parties it, of course, does no harm. It is a mere matter of bookkeeping whether a railroad debits nothing and credits the surplus for the year, say, $100,000, or debits the aggregate surplus from past years, say, $1,000,000, and credits $1,100,000 to go forward to the next year on the debtor side. But the report of the Michigan Commissioner shows that this practice will be misunderstood. He attempts to account at some length for the $14,000,000 surplus of the Chicago & Northwestern, or the $8,000,000 of the Lake Shore, and assumes that nearly all of it is awaiting the authority of the directories to write it off to the debit of the accounts for which it is already expended.

We do not quite understand the language used by the Commissioner, but he pretty clearly assumes that the item has or ought to have some relation to existing cash assets: whereas, of course, the greater part of it represents undivided profits of previous years actually used in construction and properly *credited* under that head in the construction account. In the income account of the next year it serves merely as a balancing item; and, though habitually included in this account by a large part of our roads—perhaps the majority—it really has no business there. The income account is an account of operations for the year. Permanent investments do not belong there, even if their cost was met by surplus income of past years. How the owners of a road got the money by which it paid for its construction—whether by subscribing it, or borrowing it, or earning it, or even stealing it—may be an interesting matter of history, but it does not belong to the current record of the year's operations.

If it should be urged that capitalized surplus may properly be indicated as being a fund available for possible stock dividends, the reply is that stock dividends themselves have no business in the income account. The income account is the treasurer's balance sheet for the year, less the extraordinary expenditures and the means by which they were met. If we choose to include surplus from past years on both sides as a balancing item, there is really no reason why we could not go on and include the whole debit side of the general balance sheet, provided we took care to charge it in the same way on both sides of the account and at both ends of the year. It would be unwise, because it would make the report harder to understand. But the present practice is, in one respect at least, more misleading, because a surplus from past income account seems to the uninitiated to be a matter of cash assets, whereas the two have absolutely no connection with one another.

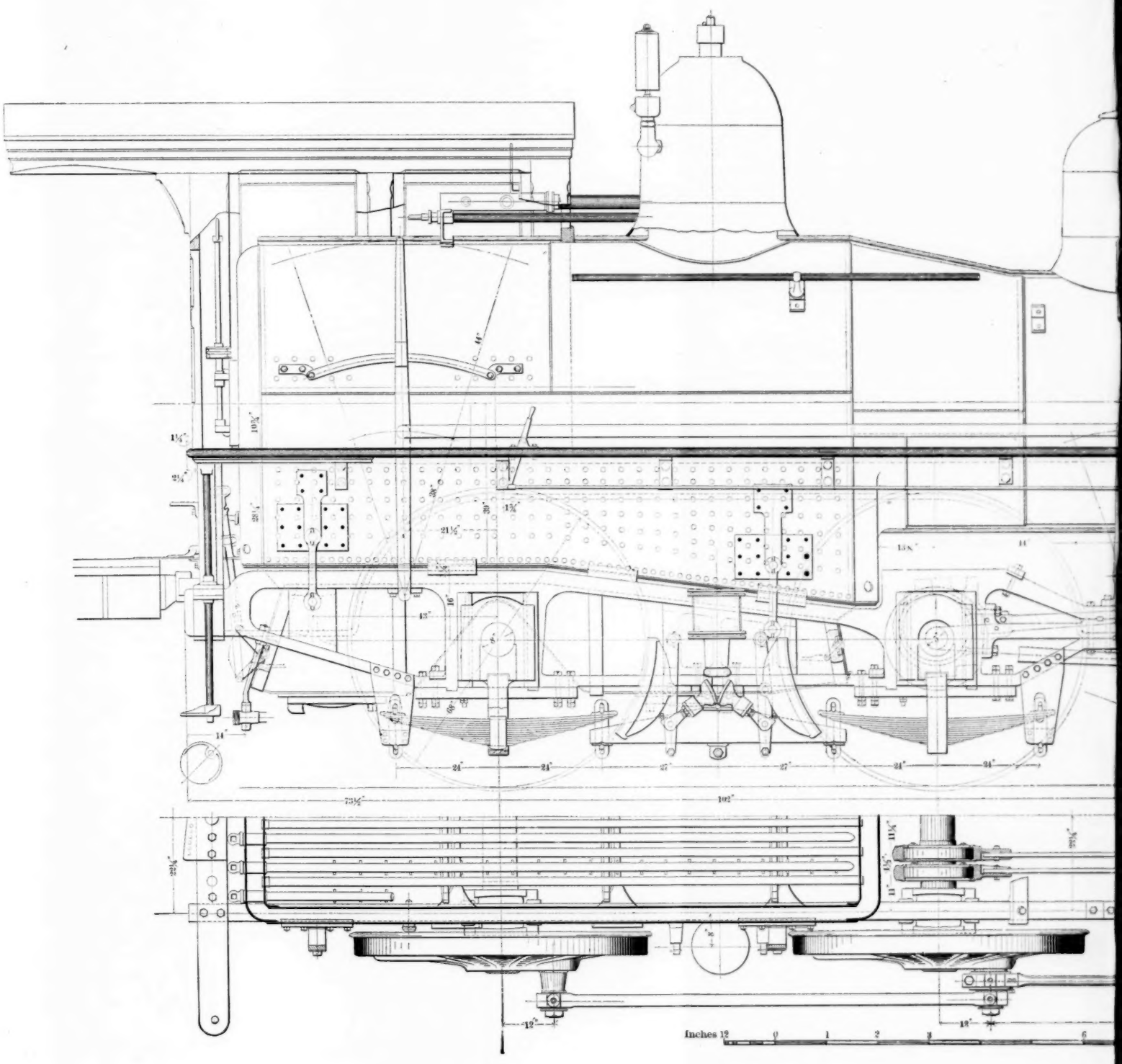
If the United States Commissioners, in prescribing the form for railroad accounts, make any provision with regard to this matter, we trust that they will endeavor to make each year stand by itself, using the surplus for each year as the balancing item in the account of that year. If this balance is on the credit side, as it generally ought to be, it will appear on the debit side as an addition to the liabilities in the next general balance sheet. If it has actually been spent for new construction it will be written off as such, and will appear as an asset in the construction account. Whatever part of it has not been thus employed will go to swell the amount of cash assets carried over to the treasurer's balance sheet of the following year; but in neither case will the surplus of one year, as such, be mixed up with the accounts of the next. If it has not been spent it will be included in the time balances, not because it was income, but because it is cash. If it has been spent it certainly does not belong in the income account.

The State Railroad Commissioners of Minnesota have lately issued an order to the effect that after Jan. 1, 1888, the upper berth in a section shall remain closed until it is actually needed for an occupant. The Commissioners probably find authority for this order in some one of the nine separate acts, relating to railroads, which were passed by the Minnesota Legislature in the session of 1887. Whether or not such minute regulation by law of the conduct of railroad travel is constitutional, practicable or desirable are serious questions; but the practice against which this order is aimed is one of the disagreeable results of the conditions under which the sleeping car business has long been done. The lack of competition has developed some short-sighted regulations and practices on the sleeping cars, and this one of making down the upper berth, whether it is sold or not, is one of the least reasonable and most annoying. Travelers submit to it because they have no alternative. It is exasperating to the occupant of a lower berth to have his breathing space and head room needlessly cut off by an unoccupied upper berth, but his only present remedy is either to buy the whole section, to bribe the porter to leave the upper berth closed till it is sold, or, simpler than all, to push up the upper berth himself after the porter has done fussing in the section. This last remedy is high handed, but effective, and very satisfying. The traveler cannot often take his choice of two sleeping-car lines to his destination, and is helpless against the arbitrary regulations of one. It is no wonder that relief is sought in legislation and in appeal to state commissioners. There is one young road running into St. Paul which has its own sleeping cars, and the managers of this road, prompted by an enlightened self-interest, instruct the porters to leave the unsold upper berths closed. The customary reason given for making down all the berths is that passengers grumble if they are disturbed during the night, but the managers of the road of which we speak give a passenger the privilege of taking his chances. He may, if he wishes, have the benefit of the whole section till the upper berth is actually needed and take the risk of being awakened in the night. It may be that the comfort of passengers in the aggregate is not much increased by this arrangement, but they are made to feel that the company is ready to consult their wishes in little things, and that alone goes a great way. There is an indirect advantage of this practice in the effect on employés of being made to feel that it is their duty to find out what passengers wish to do, and not to dictate to them what they *must* do. Much of the misery of sleeping car travel will disappear when porters and conductors are made to realize that they are the servants, and not the masters of their passengers. The traveler is sure to think sometimes, whether justly or not, that the insolence and avarice of a porter are the expression of the spirit of the company which employs him, and many a man has ached to thrash a greedy and tyrannical negro and so vicariously punish the company. It is but a few days age that we saw a sleeping car porter make himself (and, of course, his employers) most offensive to many of the occupants of his car by announcing that he had received but 25 cents from a theatrical troupe then on board, and by expressing the opinion that actors were a poor lot any way. He had not the decency to hide his opinions from the actors themselves. It was evident to all that, to him, passengers were simply prey. The repetition of such experiences exasperates those who travel, and leaves the companies without friends in the legislatures.

Fuel Economy.

Many great mechanical improvements, destined to add to the efficiency, safety and economy of operating, have made notable progress in the last year.

The general adoption of a safe and automatic freight car coupler is near at hand, and it is possible to work the longest freight trains with an efficient continuous automatic brake. In passenger service the possibility of safety and economically heating cars with steam from the engine, is now fully demonstrated. The general adoption of all these devices will yet take time, but so much of the fight is over, that much of the thought and energy which it has absorbed can now be spared for other matters. In watching the progress of improvements, one is

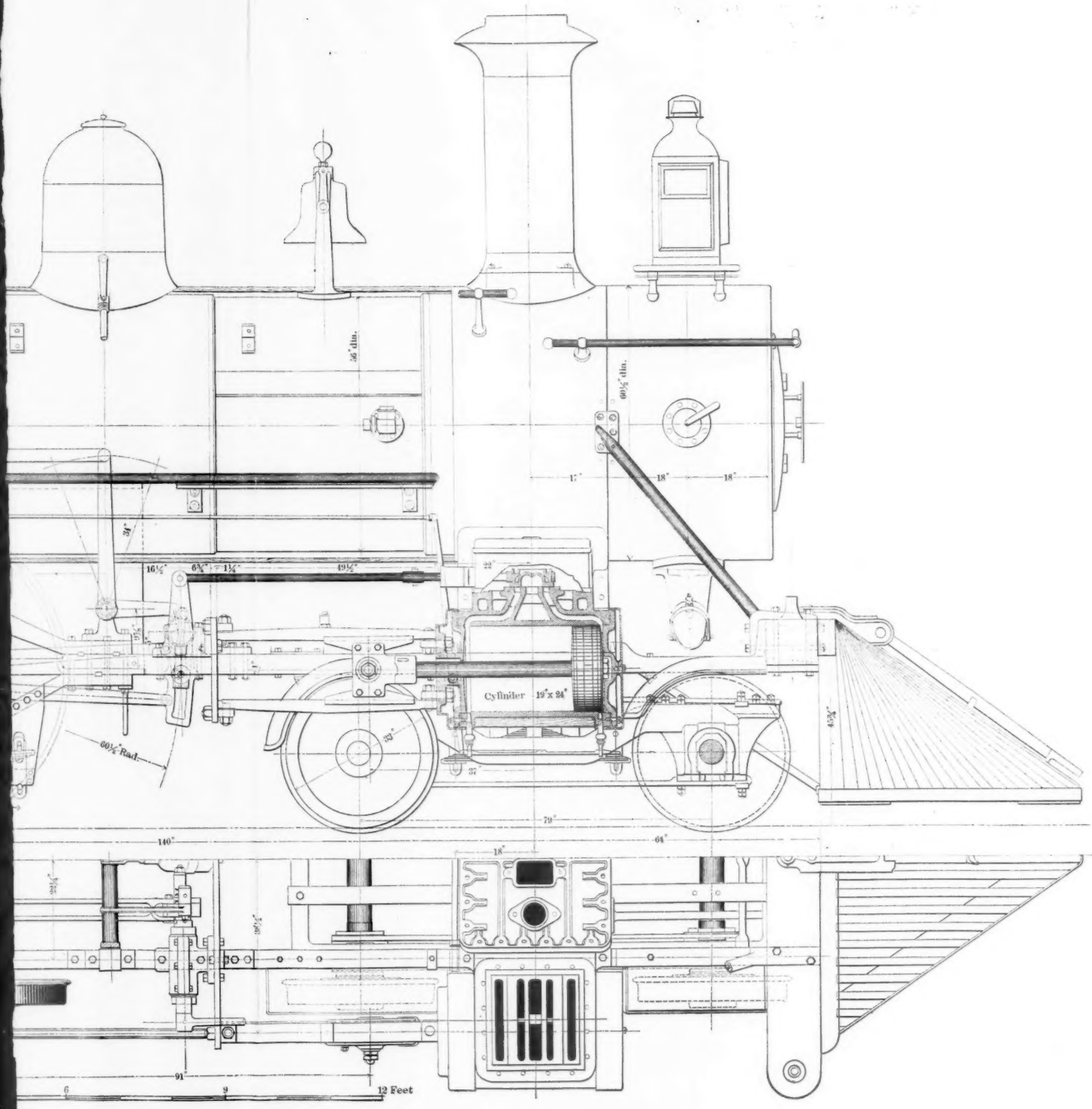


EXPRESS PASSENGER LOCOMOTIVE, NEW YORK, LA

Designed by JOHN W. CLOUD, *Sup't. of*

Built at the Company's Shops, Susqu

For Description, see Page



YORK, LAKE ERIE & WESTERN RAILROAD

D, *Sup't. of Motive Power.*

Shops, Susquehanna, Pa.

n, *see Page* 3.

struck by the loss of time and energy involved in isolated and desultory efforts as compared with the results of systematic and concerted action. When many men act together the short cut is found. This has been remarkably well shown by the brake trials of the last two years, which it is safe to say have accomplished more than could have been brought about by ten years of experiment on individual roads.

There is one most important direction in which experiment has been but desultory, that is the study of locomotive fuel consumption, especially as regards soft coal burning. Charles Wye Williams stated years ago that in his experience as a mechanical engineer, extending over many years, he had noticed more indifference on the part of those who had large sums of money at stake, in the matter of using coal, than in any other matter connected with his profession. This charge holds true to a great extent at the present day, especially as regards economy of fuel on locomotives. A close examination of the reports of the Master Mechanics' Association will show that very little has been shown in this direction as the results of concerted action, or as records of careful experiments. The statements made are, as a rule, individual assertions unaccompanied by statistics, and hence of comparatively little value. The progress made falls short of what should be expected.

In times past the cheapness of a single ton of coal accounted somewhat for the fact that mechanics preferred to spend their thought in improving methods in other directions, losing sight of the fact that the increase of mileage and traffic on the average road had swelled its yearly coal consumption to hundreds of thousands of tons, and that even a fractional saving would result in a large yearly aggregate sum. If we estimate the train-mileage of 1887 at 600 millions, and taking 25 train-miles per ton of coal as the average performance, the locomotives of the United States will have burned last year 24 million tons of coal. But as the work accomplished in hauling a train on the average road only utilizes about three per cent. of the actual power stored up in the coal, it would seem as if at least half of this coal ought to be saved.

An examination of the various items of operating expenses, carefully comparing progress in the past with what is probable or possible in the future, shows that the greatest chance for any future gain exists in the item of fuel. The coal bill now amounts to from nine to twelve per cent. of the total operating expenses proper, and a reduction of this by one half, as seems fairly possible, would represent a saving of four to six per cent. in operating expenses, equaling say three per cent. of the gross earnings, and making an appreciable sum to apply to interest on bonds, or dividends on stock.

Many of our roads spend now at least $500,000 a year for coal. A saving of one-half would amount to $250,000, which would equal four per cent. interest on $6,250,000 of bonds, or a two per cent. dividend on $12,500,000 of capital stock. This $250,000 might often decide the question whether a road would be able to pay a dividend or the interest on a certain portion of its bonded debt. In fact, in the near future, the efficiency with which the coal question is handled, will draw the line between solvency or a reign of receiverships on many roads. Any reduction of operating expenses in the future must be made by savings rather than by radical changes in methods, and in no direction does the saving seem more possible than in the coal bill. The average rates received for hauling freight and passengers are reduced every year, but the reduction in cost of working has not generally declined in proportion, and as the increase in traffic handled does not make up for the difference, further economy is absolutely necessary.

When the united and intelligent action of the mechanical and managing departments of our roads have brought to a successful issue the questions of continuous heating and automatic freight car coupling, it is to be hoped that combined action will be exerted in the direction of fuel economy, resulting in a locomotive engine which, though simple in construction and light in repairs, will make neither smoke nor sparks, while the result in work done for the amount of fuel used will surprise the majority of the master mechanics of the present day. Skillful care and attention and the union of the best features of devices already in more or less successful operation will in all probability suffice to secure such a result.

Reform in Highway Bridge Building.

Under the title "General Specifications for Highway Bridges of Iron and Steel," Mr. J. A. L. Waddell, of Kansas City, Mo., has issued a pamphlet of about fifty pages, in which the evils of the present method of building these structures are plainly stated, and suggestions are made as to the best way for effecting a reform. Mr. Waddell is well known as a competent writer upon bridge matters, and he is also fully aware of the magnitude of the evil which he attacks. He is sure to have the sympathy of every right-minded engineer, and should also have the active support of all in his campaign against the dishonesty, recklessness and incompetency which play so prominent a part in the establishment of the highway bridges throughout this country.

The pamphlet commences with ample illustrations of the nature and extent of the evils attending the present mode of buying highway bridges, and with the numerous disreputable practices of the "scalpers" and traveling agents of what the author very properly calls the "highwaymen." This is followed by two chapters, "How bridges are built," and "How bridges ought to be built." The difference between the two places in a strong light the numerous glaring defects which stamp the work of the disreputable concerns, whose only object is to make bridges to sell.

In chapter VI. it is proposed (inasmuch as the public does not care to trouble itself in regard to these matters, and as public officials are very often either so stupid as not to see the need of getting good work, or so dishonest as to join the builders of cheap bridges in their schemes) that the reputable bridge companies shall form an association, both for mutual protection and for the public good. This association would prepare such a set of specifications, regulating the style and strength of all bridges to be built in future, that no such thing as a defective or unsafe bridge could be erected by any of its members. Any departure from these specifications, tending to reduce the quality of the work, would be considered evidence of fraud. The general scheme of the organization would be that each company should deposit with the treasurer a certain sum of money, to be held by him as long as the company should continue to be represented in the society, as a guarantee that said company will comply with all the rules and regulations of the association. Should at any time the company, or any of its agents, fail to do so, a standing committee, to act as judges, should decide how much of the deposit should be forfeited for the offense, and the company should be deprived of all the rights and privileges of membership until such time as the amount forfeited be replaced. The privilege of membership should be given to any one willing to comply with the rules of the association. Should any company refuse to join, and continue to build bad bridges, it would soon be forced into the association, or out of the business. The country blacksmith would no longer be allowed to buy a few gas-pipes and connect them by inefficient details, and call the result a bridge. Ignorance and dishonesty would be obliged to give way before skill and honesty. Such a society could dictate to town and county officers the quality of bridges they should build, and could prevent the erection of all bridges not up to a certain standard. By taking into the union the manufacturers of bridge material, iron for doing inferior work could be driven out of the market. Such an association should make public announcement of its purposes and its rules, and should guarantee to buyers that any bridge sold by any of its members shall be in all respects up to the specifications. The double end to be attained by this association of bridge companies would be the insuring to its members a fair profit on every contract taken, and furnishing to the public in every case a bridge which would be guaranteed absolutely safe and sound. By such a system the cost would be reduced to the lowest possible amount for good work, and any town or county not going to such an organization for a bridge would at once place itself in at best a very questionable position. The last half of the pamphlet consists of a carefully studied specification in detail, prepared from the best and most recent documents of the kind.

However much we may doubt that the millennium in bridge building is near at hand, it is certain that Mr. Waddell's pamphlet is full of good suggestions, and aims to remove a source of perpetually recurring disasters. Any change in the manner of getting highway bridges must be for the better. It is only by constant warfare against the dishonesty and ignorance which mark so much of the highway bridge practice in this country that any improvement can be made. The fact that over twenty of these bridges fall each year in the United States would seem to show that something ought to be done. Except a little flurry in the papers immediately after each disaster, the public is entirely indifferent. A few years since an iron highway bridge was built in one of the Middle States, which was guaranteed by the makers to carry safely a moving load of 2,240 lbs. per running foot. Such a load would have strained the iron in some parts of the work to 56,000 lbs. per square inch in tension. The weight of the bridge alone kept 15,000 lbs. per inch on iron which was of the most inferior quality. The bridge having been condemned, after a long controversy, was removed and replaced by a better one. *The condemned bridge was afterwards again sold by its original builders, without any alteration whatever, and guaranteed by the company to carry safely a moving load of* 3,000 *lbs. per running foot.* This is only one among many illustrations of the wickedness and ignorance that are to be overcome by any one who would reform the present practice in highway bridge work. A few years ago it chanced that one of the most disreputable concerns in the United States underbid all other competitors, and, somewhat to its own astonishment, secured the contract for a large city bridge. The work had to be done according to the plans and specifications, and under the inspection of the City Engineer. The result was a considerable loss to the contractor, who made the remark, after the bridge was finished, that it would take at least ten good highway jobs to make him whole.

Whether the reputable concerns in the United States care enough about the highway work to organize as Mr. Waddell suggests, in order to get it, is doubtful. Our reliable companies certainly never will descend to the methods employed by the ordinary builders of highway bridges. The disreputable concerns depend almost entirely on the highway work, and will leave no stone unturned to get it. If it was possible to hammer into the heads of the public the truth of the maxim, that, *A preventable disaster is a crime*, and if the public cared enough about it to hold public officials accountable for their blundering stupidity, possibly something might be done. It is a perfectly well-known fact that nine out of ten of the bridge disasters so common in this country can without the slightest question be prevented if we care enough about it to do it. Just as long as ignorant town and county officers allow themselves to be imposed upon by reckless and dishonest contractors, just so long will highway bridges continue to break down. There are, without the slightest question, hundreds of highway bridges in this country to-day which are on the eve of falling, and worse yet, new bridges are being made every month which are no better. One company has not hesitated to say that it gives a bridge according to the money a town or county wishes to spend. Another concern stated plainly recently: "There are good bridges, better bridges and best bridges, and we make all three kinds." In one of this company's bridges, which it had guaranteed to carry safely a moving load of 3,000 lbs. to the running foot, and which it called one of its best, the iron in the lower chord was strained to 15,000 lbs. per inch by the weight of the bridge alone, and to 46,000 lbs. per inch by the guaranteed safe load; and by the company's own admission it builds two classes of bridges inferior to this.

Suppose we should send a man round the country to place a sign upon each bridge stating in plain terms the exact condition of the work, we should have something like this: "This bridge is guaranteed to carry a moving load of one ton per running foot, but half that load will break it down;" "The iron in this bridge is strained to double the safe limit by the weight of the bridge alone; passengers will please to tread easy;" "Not more than one team at a time must go over this bridge, and not over twenty people must cross at the same time; it is liable to fall at any moment with a heavy load;" "The public is warned not to cross this bridge when the wind blows, as it has no lateral bracing;" "This bridge will be closed until next summer, as the weight of the snow upon it is all that it can safely carry." What would the long-suffering tax-paying public say to notices of this kind? Would they think they had their money's worth in the bridge? Yet this is exactly what ought to be placed upon a very large number of the highway bridges in this country. Suppose we should employ competent engineers to examine every highway bridge in the country, and that in each town and county a statement of the exact strength of the bridge should be publicly posted, with the names of the builder and of the town officials who bought the bridge. Would not a good many men find themselves in a disagreeable position? We can hardly expect to make public the bribery and corruption that in many cases enter into the highway bridge work; but we can make known the exact condition of any bridge. We can show about what risk the public is subjected to, and we can give the names of the officials who are accountable for that risk. Possibly some exposition of this kind will show the need of the reform so strongly urged by Mr. Waddell.

When the disease is fully recognized, and not until then, will the public demand a cure. The demand for honest bridge work must be felt before the supply can be offered by any organization. Meanwhile, let the efforts of Mr. Waddel, and of all others engaged in the like work, receive the hearty approval of the engineering profession.

Annual Output of Locomotives and Rolling Stock.

The accompanying table has been compiled from figures furnished us by the principal railroads and builders of locomotives and cars in the United States.

The figures, as to locomotives, do not include any built by railroad companies at their own shops, but probably represent pretty correctly the total output of private firms for the eight years, 1880-1887, inclusive, embraced in the table. No less than 19 firms of locomotive builders have kindly replied to our queries. Only two firms declined to furnish any information, and no reply has as yet been received from a third firm. The total output of these three builders would, in all probability, not much exceed 100 locomotives during 1887, and would probably fall below that figure for any previous year. Eleven out of the 19 firms contributing to the returns built more than 50 locomotives each during 1887, and a similar number of firms have averaged over 50 engines per annum for the eight years 1880-1887.

It will be seen that the total number of locomotives built in any one year is subject to considerable fluctuations, and the experience of individual firms indicates even wider variations One firm built nearly five times as many locomotives in 1887 as in 1884, while another firm built three times as many in 1887 as in 1884. It will be seen from the table that the total output in the worst year, 1885, was 800 locomotives, or only 35 per cent. of that in the best year, 1882. Similar fluctuations are observable in the returns of nearly every firm, the smallest variation being in the case of one firm, where the lowest output in 1880 was 48 per cent. of the highest in 1887.

The improved output of 1887, as compared with 1886, was shared by every firm contributing to the returns, all showing an increase of at least 10 per cent. in the output and many over 50 per cent.

The increased weight and power of the locomotives built during the past few years must be taken into consideration in examining these figures, and there can be little doubt that the 2,044 locomotives built during 1887 represent a greater weight of metal and more haulage capacity than the 2,277 locomotives built in 1882, many of which were for the narrow gauge. The gradual increase in the number of engines with cylinders of 18, 19 and 20 in. diameter has been very noticeable of late years, and when this fact is taken into consideration, the year 1887 shows a slightly smaller increase in numbers, but probably a larger increase in power than even the prosperous years 1882 and 1883.

The returns as to freight cars are unfortunately not so complete as those relating to locomotives, and cannot be taken to represent the total annual increase for the whole country. The relative increase in one year as compared with another is probably fairly shown.

The figures at the bottom of the table seem to indicate that an unusually large proportion of coal cars were built in 1887, and that the number of freight cars built bears an average proportion to the number of locomotives built. During the three years 1880, '81 and '82, an unusually large number of cars was built in proportion to the locomotives. The result of this over production was felt in the great depression in freight car building during the years 1884 and 1885, when the production of cars diminished in a faster ratio than the production of locomotives. The fact that 15 large car works only built 2,000 freight cars in 1885, against nearly 16,000 in 1881, shows the severity of this depression.

The returns for passenger cars are also incomplete, and cannot be taken as a guide to the total output, though the relative production of one year compared with another is probably fairly indicated.

Taken as a whole, the returns certainly show that the locomotive and car building industries are in a fairly flourishing condition, and the continued extension of railroads and the national growth of traffic on lines open will probably continue to provide plenty of work for locomotive makers and car-builders during the present year and for some time to come. Fluctuations must, however, apparently be expected in such a business, and must necessarily affect all calculations as to probable profits.

Report of the Commissioner of Railroads, State of Michigan, for 1886.

The report of the Michigan Railroad Commissioner for the year 1886 shows clearly the effect of the cessation of the railroad wars of 1885. The better financial condition of the roads is not, however, due to this alone. There seems to have been an improvement in railroad economy as well as in rates; an improvement greater on the whole than the financial exhibits themselves would show.

There is a considerable apparent decrease in the mileage on which the reports are based, due to the withdrawal of some 700 miles of road from the control of the Wabash. As a result, absolute comparisons between the total figures are almost valueless, and it is only by comparing the ratios that we gain much idea with regard to the traffic conditions.

The train mileage has remained nearly stationary; that of freight showing a slight absolute decrease, although there is an increase in comparison with the length of road on which these reports were based. The figures are as follows:

	1886.	1885.
Passenger	23,440,734	23,115,894
Freight	38,189,469	38,451,871
Total earning revenue	61,630,203	61,567,765

In spite of this absence of increase in train mileage there was a distinct and marked increase of earnings; on passengers, from $19,782,000 to $21,275,000; on freight, from $52,742,000 to $57,187,000; and on the total, including miscellaneous, from $76,953,000 to $82,834,000. The earnings from passengers per passenger train mile increased from 85.5 cents to about 94 cents (not 107 as stated in the report); while the earnings per freight train mile increased from 136 to 151.4 cents.

This increase of about 10 per cent. is a large one, and can be accounted for by a combination of three causes:

1. Rates were unquestionably much better maintained in 1886 than in 1885. The average rate per passenger-mile increased from 2.05 cents to 2.23 cents; the average rate per ton-mile from 0.82 to 0.89.

2. By a relative increase of short distance traffic. The average haul per train in 1885 was 173 miles; in 1886 it was only 160 miles.

3. More remarkable than all, a distinct increase in the train loads. If the figures are correctly reported, the average passenger train load has increased from 38 to 41; while the average freight train load has a little more than held its own in spite of the shorter hauls, though the difference in this respect is very slight.

All this is good. Equally good are the indications from the classification of operating expenses, as shown in the following table:

	1886.	1885.	Change per cent. Inc.	Dec.
Maint. of way	$12,121,071.33	$11,139 667	8.81	....
Maint. of rolling stock	8,133,599.34	8,119,431	0.17	.....
Conducting trans.	26,627,559 96	27,461,522	....	3.14
Gen. exps. and taxes	7,334,393.56	7,340 369	....	.008
Total operating exps. and taxes	$54,138,685	$54,216,624 19	.14	.....
Per mile of road	$4,661	3,958	....	15.06
Per train mile	87.9 cts.	87.97 cts.	....	.....
Per cent. of earn.	70.35 cts.	65.45 cts.	....	4.90

It will be seen that the general expenses have remained practically stationary, as they should; that the transportation expenses have diminished, which is a good sign, while those for maintenance of way and rolling stock have distinctly increased. In other words, the same number of trains have carried a larger load shorter distances at a less cost, and the money thus obtained has been spent for improvement of permanent way. This is a remarkably good showing. Nor is it probable that the exclusion of certain of the Wabash lines has a sufficiently marked effect to account for very much of this change.

On the other hand it should be noted that the year 1885 was more conspicuously bad in Michigan than in almost any other part of the country; so that these improvements, except the reduction in transportation expenses, do not appear in such a striking light if we compare them with the earlier reports. Passenger earnings were higher in 1882, 1883 and 1884; freight earnings were higher in 1882 and in 1883. Much more was spent for maintenance in each of those years than in 1886. All this goes to weaken any inferences which might be drawn from this report as to the financial condition of the railroads; but it does not prevent us from drawing favorable conclusions as to Michigan railroad economy and management.

The Commissioner calls attention to the private logging roads in the state, the number of which continues to increase until they have now about 500 miles of track. Although they are frequently built across the lines of incorporated companies, they are not subject to the railroad police regulations of the state, and in many instances pay no regard to the precautions necessary for the safety of the public or their own employés. It is also the case that many of these roads escape any taxation. The Commissioner urges that they should be brought under the same regulations as the other railroads of the state. Although a bill for that purpose was introduced into the last Legislature, it failed to become a law.

The track and bridges of nearly all the railroads in the state are found on inspection to be in excellent condition and deserving the highest commendation. Two special inspections of track have been made—one where complaint was made of the unsafe condition of the track and the complaint was found to have been justified. Extra precautions and reduced speed of trains were ordered until the track could be put in repair, which was promptly done. The other special inspection was of the Sault branch of the Duluth, South Shore & Atlantic. The track was found to be in excellent condition for a new one. Two special inspections of bridges were made by experts, and in both cases repairs recommended were made by the companies.

Since the last report 4,852 feet of trestle has been replaced with earth embankments. Out of 275 timber culverts renewed during the year, 209 were rebuilt with perishable materials, which the Commissioner considers contrary to sound economy. The bridge structures in the state now aggregate 48.85 miles, or one bridge for each 2¾ miles of track. There have been no accidents resulting from weak bridges, and the care of the railroad companies in keeping their bridges in safe condition is specially noted.

There are in the state 230 railroad crossings, of which 209 are at grade, and the state laws require a full stop to be made at such places. The Commissioner describes at length the well-known interlocking and derailing devices, and states that where they are applied trains on the main line may cross without stopping. Those on the other track, however, must all stop before the crossing.

The Legislature of 1885 passed an act requiring all railroad companies to use some form of automatic or safety car coupler on freight cars which they might buy or lease, and upon all old cars sent to the shops for repairs. The former Commissioner selected seven different couplers, and greater or less numbers of these have been put on freight cars for use in the state. It is now stated that, after more than a year's experience, the result is not the most desirable. There has been no great diminution in the number of coupling accidents, and uniformity is no nearer than before. The law has not been very strictly obeyed. Even had it been, it could not affect cars over which the state authorities have no control. It is found to be still the universal practice in coupling an ordinary coupler with an automatic, to put the link in the latter and guide it into the former by hand, and employés nearly uniformly express the opinion that "the automatic is no good." It is proper to say that with one exception the automatic couplers selected by the Commissioner were link and pin couplers. The Legislature of 1887 amended the former act, permitting railroad companies to use any coupler which came up to the standard fixed by the act of 1885, and which was approved by the Commissioner. Only one application was made for approval of a coupler under this amendment, and that was to permit the use of the Janney. The Commissioner, however, withheld his approval, for the reason that the Janney could not be coupled with the ordinary link and pin coupler without going between the cars, and because he considered it more than usually dangerous to couple by hand. He considers, however, that, in view of the action of the Master Car-Builders' Association, and of the fact that the Janney has come now into considerable use, it is a question whether approval of it should be longer withheld.

This experience is another confirmation of the wisdom of the Master Car-Builders in adopting the vertical plane type, and it is another proof of the importance of pushing unceasingly for uniformity. Nobody supposes that any man would go between the cars to couple two vertical plane couplers, or that the Janney is dangerous in coupling with itself or with any other coupler where a link is not used. The experience cited by the Michigan Commissioner is not a fair test of the automatic link couplers, for there was such an obvious want of uniformity that they could not prove their efficiency. It does show, however, most strongly the danger in retaining the link and the great importance of using one type. The casualties from coupling accidents were 11 killed and 100 injured.

The last week of the old year and the first of the new have been marked by the occurrence of an unusually large number of serious accidents to passenger trains. They have averaged one a day, and those attended with injuries to a considerable number of people have been uncomfortably prominent. At Augusta, Ga., and St. Petersburg, Pa., weak trestles have derailed whole trains and dropped them down a considerable height, the passengers in the former, however, escaping serious injury. At Fairfield, Wis., German Valley, Ill., Sauk Centre, Minn., and half a dozen other places, trains running at considerable speed have been derailed, injuring people by the dozen, and some of them fatally. These latter are perhaps partly attributable to cold weather, as defects in running gear or in track seem to be the most probable causes discoverable. The rear collisions because of "blinding snow-storms," are not so excusable, however, even though they be peculiar to the season. The most fatal of the list, however, are those which arise wholly

ANNUAL OUTPUT OF LOCOMOTIVES AND ROLLING STOCK, 1880-1887 INCLUSIVE.

	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.	Total.
Locomotives built by 19 private firms	2,044	1,436	800	1,149	2 087	2,282	1,977	1,405	13,160
Freight cars built by 15 car works	12,131	7,870	2,073	3,043	9,756	15,636	15,961	10,588	77,658
" " " " 29 railroads	4,014	2,225	1,482	2,634	4,031	2,943	4,085	3,250	24,664
Total	16,145	10,095	3,555	6,277	13,787	18,579	20,046	13,838	102,322
Coal cars built by 15 car works	11,644	5,067	1,729	4.425	3,927	5 035	6,535	3,510	41,872
" " " " 29 railroads	2,412	1,079	869	1,213	1,890	1,238	1,565	196	10,462
Total	14,056	6,146	2 598	5,638	5,817	6,273	8,100	3,706	52,334
Day, passenger, baggage, mail, express and caboose:									
15 car works	496	344	209	257	406	294	288	292	2,584
29 railroads	167	112	50	117	181	164	121	103	1,015
Total	663	456	259	374	587	458	407	395	3,599
Sleeping, dining, hotel, buffet cars, etc.:									
15 car works	65	53	53	64	49	50	65	16	415
29 railroads	2	4	7	8	11	10	10	1	53
Total	67	57	60	72	60	60	75	17	468
Average number of freight cars built per locomotive	7.9	7.6	4.4	5.5	6 7	8 1	10.1	9.8	7.9
" " " " coal " " " "	6.9	4.3	3.2	4.9	2.8	2.7	4.1	2.6	4.0

from "negligence in operating." Misplaced switches have for the ten-thousandth time shown that fast trains cannot safely be run through yards where the view is short and the position of facing point switches is wholly dependent on one man's vigilance. At Meadville, and Bennington, Pa., passenger trains ran into freights with disastrous results; in the former five persons were killed; the latter was less fatal, but as it apparently happened at a point where block signals are in use, it is, if possible, more inexcusable. The worst case of all was a butting collision at Greenwood, Ky., where passenger trains running at high speed met on a high embankment, killing a half dozen or more. One of the conductors misread his orders.

The morals are easily drawn; the immediate remedy, so far as there is any, needs not to be pointed out to our readers. Some of the more remote causes may perhaps be recalled to mind, though they also have been recounted often enough. The best of axles, wheels and rails are well enough known; the pinch comes at the point where renewals at high prices or retention of first-class inspectors at high (?) wages is evaded for the purpose of warding off insolvency or a lesser evil. Negligence of rear brakemen and carelessness of conductors and enginemen are well enough known to officers, but the latter do not fully realize Dr. Holmes' truth that men must be trained a hundred years before they are born if they are to skillfully fulfill their mission. Where an order is misread by a conductor who should have an engineman and an operator to check him, there is little doubt that there is some sort of slackness at headquarters.

The collision on the New York elevated road at Thirty-fourth street and Third avenue, Dec. 30, was saved from being a great disaster only by the chance that there happened to be at that point a turnout, which kept a passenger car from falling to the street. A train approaching the main line from the branch ran into the side of a moving train. There is no evidence that there was any defect in the brake, and forgetfulness or confusion on the part of the runner seems to be the only explanation. Whatever may be said about training enginemen in systematic methods of avoiding slips of memory, or educating firemen to aid them by looking out for the one chance in ten or a hundred thousand when the human machine *will* fail, it can be said that so far as practice and the familiarity with responsibility which induces a right appreciation of it are concerned, the elevated lines should be faultless. The frequency of the trains, the lack of elbow room, and other circumstances all tend as powerfully as any mere surroundings can to make a man careful.

It has been estimated any time for the last six months that the new construction of 1887 would amount to 12,000 miles. The *Railway Age* has published, with its customary promptness, a table giving the new mileage in detail. The figures are, of course, given only as the best approximation obtainable at this date, but, while they are subject to some correction, they are sufficiently accurate for purposes of comparison. The totals are confirmed by various estimates. From the table it appears that 364 lines, in 42 states and territories, built a total of 12,724 miles, and it is a fair estimate that the construction not yet reported will bring the total up to 13,000 miles. The table of the new mileage by states is very interesting. It is as follows:

States.	Lines.	Miles.	States.	Lines.	Miles.
Maine	2	31	Illinois	12	378
New Hampshire	1	33	Wisconsin	11	363
Vermont			Minnesota	9	196
Massachusetts	5	55	Dakota	17	760
Connecticut			Iowa	10	352
Rhode Island			Nebraska	17	1,101
New York	6	97	Wyoming	3	138
New Jersey	2	15	Montana	7	616
Pennsylvania	13	125	Kansas	44	2,070
Delaware			Missouri	16	554
Maryland	1	18	Indian Territory	5	499
West Virginia	3	53	Arkansas	8	153
Virginia	4	64	Texas	19	1,055
North Carolina	10	184	Colorado	9	818
South Carolina	6	104	New Mexico	1	4
Georgia	8	231	Nevada		
Florida	10	193	California	14	356
Alabama	15	515	Idaho	2	54
Mississippi	5	99	Utah	1	6
Louisiana	4	65	Arizona	2	70
Tennessee	19	66	Oregon	4	48
Kentucky	8	168	Washington Ter.	3	168
Ohio	14	155			
Michigan	13	700	Total in 42 States and territories	364	12,724
Indiana	9	115			

The 364 lines are not so many different companies but are main stems, branches and extensions built under various names by a much smaller number of companies. It will be noticed that Alabama and Texas are the only Southern states with over 500 miles each. The total mileage in the Southern states east of the Mississippi River is 1,760 miles, or nearly 14 per cent. of the total. In Wisconsin and the states and territories west to the Pacific, including Iowa and Nebraska as the most southerly, the new building was 3,736 miles, or 29 per cent. In Missouri, Kansas, the Indian Territory, Texas and Colorado the new road was 4,996 miles, or 39 per cent. These three groups include, it appears, 82 per cent. of all the new construction. But over half of the new mileage is found in four states and two territories, viz.: Kansas, Texas, Nebraska, Colorado, Dakota and Montana. These figures not only throw a flood of light on the local real estate and business "booms" of which so much has been heard all the year, but they go far to reassure those who have been worried about over-building. It is now seen how much of the new road is in territory still inadequately supplied, and in regions of great undeveloped resources. It should not be lost sight of that the railroad extension of the last year has been very largely by old companies who put a thoroughly organized and equipped transportation machinery into those regions. The result should be, and we may suppose it will be, a rapid growth of the country served. Moreover, it seems to be a fact that the new building of the year has been done at low figures, and even if fixed charges are not earned for a few years, ordinarily the deficit will be so small that the companies can carry it without embarrassment. It must not be expected that 1888 will see nearly so much new building. That of 1887 was largely provided for before the year began, but for many months the money market has been such as to make it very difficult to place construction bonds either at home or abroad.

From other sources it appears that 10 roads which reach St. Paul and Minneapolis, and half a dozen other lines which are direct extensions of those 10 roads, and controlled by them, have built some 2,700 miles this year. Naturally the people of those cities expect great things from the extensions into new territory, east, west and north; from the promised new lines to Omaha and Kansas City, and still more from their new route to the Atlantic. They have good reason to expect another line to Lake Superior within another year; and, with less reason, they believe that before the end of 1889 the Manitoba will have a line through to the Pacific coast. The business of the two cities has grown much in the last year, stimulated by the actual and prospective railroad building. The bank clearings of St. Paul, for 1887, were about 204 millions, as against 150 millions in 1886. The real estate transfers are said to have amounted to 50 million dollars, and the sum spent in building was eleven and one-half millions. In Minneapolis, the real estate transfers the first nine months of 1887, were $44,264,000 against $38,319,000 for the year 1886. The receipts of wheat at Minneapolis in the crop year ending Sept. 1, 1887, were 39,278,380 bushels, against 32,736,980 in 1886.

In Kansas City the commercial and industrial growth during the year has been even more remarkable than that of the Northwestern cities. Local newspapers give the bank clearings as about 390 million dollars in 1887 and 284 in 1886. The real estate transfers increased one-half in the year, and are placed at the astonishing figures of 136 million dollars. Fifteen millions are said to have been invested in new buildings.

The *Manufacturers' Record* publishes a review and summary of new enterprises started in the 14 Southern states during the year 1887. The previous year, 1886, which was remarkable for the progress made, has been surpassed beyond all expectation. In the number of establishments started, many branches of industry show twice as many in 1887 as in 1886; and in capital invested ten of the states report more than double the amount of 1886, while of the other four, three show increases of 90, 70 and 40 per cent. A great variety of trades are represented—iron, flour, cotton, cotton-seed oil and other mills, electric light and natural gas companies, etc. Some of the more noticeable increases are:

	1887.	1886.
Cotton mills	77	9
Mining enterprises	502	174
Brick works	169	53
Iron manufactures (not furnaces)	71	26
Cotton-seed oil mills	18	4

In both iron and cotton manufacturing those who have been in the business longest are making the largest investments in new plants. The figures showing "capital" of course do not all represent actual cash investments, but they afford a means of comparing states and of comparison between the two years; moreover, hundreds of small enterprises do not get into the record, and land companies organized for developing manufactures are omitted entirely. The capitalization is tabulated by states as follows:

	1887.	1886.
Alabama	$47,892,000	$19,848,000
Arkansas	24,466,000	15,240,000
Florida	2,786,000	1,659,000
Georgia	15,361,000	3,599,000
Kentucky	40,053,000	28,404,000
Louisiana	8,218,000	2,240,000
Maryland	15,187,000	8,765,000
Mississippi	4,771,000	774,000
North Carolina	9,767,000	5,676,000
South Carolina	3,895,000	1,208,000
Tennessee	35,867,000	21,240,000
Texas	16,430,000	5,694,000
Virginia	23,255,000	8,514,000
West Virginia	8,266,000	3,365,000
Total	$226,298,000	$129,226,000

The decision of the Inter-state Commerce Commission in the matter of the express companies was rendered Dec. 28. It gives an elaborate statement of the nature and status of "express business," quoting the decision of the United States Supreme Court that railroads may rightfully make an exclusive contract with a selected express company for the handling of all the express business on its line. The Commission holds that a railroad doing its own express business is undoubtedly subject to the law as regards that department, as fully as in respect to ordinary freight traffic; but the ordinary express companies are not subject to the provisions of the act.

This decision will cause no surprise. In the report to the Secretary of the Interior, the Commissioners had already said as much. They now simply state the ground for their action; and practically, the decisive ground was that it is safer to construe statutory powers narrowly.

The definition in the first section of the act, that its provisions apply to "any common carrier, or carriers, engaged in the transportation of property wholly by railroad or partly by railroad and partly by water," is really ambiguous. The amount of team and messenger service performed by the express companies may perhaps exempt them from this definition. But when the Commission says that the companies are not necessarily included in the operation of the act, it does not say that they ought not to be. On the contrary, the Commissioners obviously desire it. They say that the principles of the act are such as are justly applicable to the business of express companies; that there is nothing which makes it impossible for such companies to conform to the requirements of the act; and that "the bringing of express companies within the salutary provisions of the act to Regulate Commerce is practicable and on some accounts desirable." It is simply as a matter of strict legal construction, and not on grounds of public policy, that they limit their jurisdiction.

The report that the Philadelphia & Reading are abandoning the Wootten fire-box is incorrect, and probably arose from the fact that in future it has been decided not to use the Wootten fire-box on all engines indiscriminately, but only on those where the fine or dirt coal can be burnt. The Wootten fire-box, while heavier in first cost and repairs, is the only known device that efficiently utilises this waste fuel which would be otherwise wasted, and therefore in future a sufficient proportion of the new engines built on the Philadelphia & Reading will have the Wootten fire-box.

Experience on other roads where ordinary coal is dear and small coal largely composed of dirty coal dust is cheap, has shown that the possibility of using this cheap fuel will offset any increased cost of repairs and the increased first cost and dead weight of the locomotive.

Mr. Charles Latimer, whose long and valuable services and whose endearing personal qualities have made him one of the best-known of railroad men, writes as follows:

"Would you oblige me by informing me through your paper what engineers and other persons in the world are constructing or inventing, or have invented, airships of a practical nature, giving their addresses? It is my desire to bring to the knowledge of such the inventions of a distinguished civil engineer in this country, a friend of mine, lately deceased. He has left a large amount of plans and manuscript, and information on this subject, with patents from various parts of the world. I desire to make these inventions useful, and I would like to enter into correspondence with these inventors."

The *Railroad Gazette* tries to keep a sharp eye on those agencies of transportation which move on the surface of the land, or go to but little depth below it, with an occasional glance at the Erie Canal and the great deep, but it has not yet tried to follow transportation into the heavens above. Mr. Latimer's question is therefore referred to those of its readers who have.

Official statistics have lately been published of the methods of lighting the cars of passenger trains on the German railroads, not including those of Bavaria. Out of 19,663 cars, 11,938 were lighted with gas, 5,303 with oil and 2,420 by candles.

These three methods were used in the proportions shown in the following table in the years indicated. The table gives the percentage of the passenger cars which were lighted by each method:

	1879.	1882.	1886.
Gas	16.4	31.3	60.7
Oil	67.8	53.5	27.0
Candles	15.8	15.2	12.3

It is seen that gas has largely superseded oil. Candles are hardly used longer except on secondary lines. The gas is usually under a pressure of six atmospheres, and enough is stored under each car for 30 to 36 hours of lighting. The Pintsch system is that universally used.

A case of interest to car inspectors and yard masters, as well as to all train and track men, as illustrating a phase of the employer's liability question, will be found in our legal column this week. It is also worthy of note in respect to its bearing on a clause in the Uniform Code of Train Rules. The legal column also contains, as usual, a number of interesting illustrative cases, which will be appreciated by superintendents, train men, station agents, and others. Several decisions of importance by the United States Supreme Court are included in the list.

Five of the leading millers of Minneapolis give éclat to the opening of the Minneapolis, Sault Ste. Marie & Atlantic by shipping a train load (20 cars) each of flour over the road. The whole hundred cars started on Thursday of this week, and all were gaily decorated in a manner suitable to signalize the opening of the new route to the seaboard. Twenty car loads go to London via Boston, 40 to New York, 20 to Boston and 20 to Philadelphia.

The newspapers have continued to print columns of matter concerning the strike of the Philadelphia & Reading train and yard men, but there appears to be comparatively small ground for wasting space with it. Apparently the coal miners and the coal handlers on wharves, etc., employed by the company, with the trainmen and the enginemen (there being few if any members of the Brotherhood of Locomotive Engineers on the road) belong nominally to the Knights of Labor; but the looseness of the ties that hold them to this organization, together with the insufficiency of the grounds on which the strikes were ordered, have had the effect of largely nullifying the orders which the leaders have issued and so loudly heralded through the press. The only cause for striking was the employment of a half-dozen non-union men as shovelers, in place of some who refused to handle coal consigned to some party whom they wished to boycott. A comparatively small number of yard trainmen would strike at one place, and by the time their action was followed at another point the first-named would come to their senses and resume work. This has been repeated with variations two or three times, but the road

found new men so plenty that substantially all inconvenience in running trains was soon over. Within a few days, however, a strike has developed among the company's miners which threatens to assume serious proportions, and may be harder to handle.

NEW PUBLICATIONS.

Biographical Directory of Railroad Officials. This work of reference, published by the *Railway Age*, Chicago, has just been revised and a new and enlarged edition issued. The biographical portion is supplemented by an alphabetical list of officers who were too modest to tell their records, and another of officers who have died since the first edition was issued.

Lighting of Railroad Stations.

ABSTRACT OF A REPORT TO THE INTERNATIONAL RAILROAD CONGRESS, PRESENTED AT THE MILAN SESSION, 1887.

In the towns through which railroads pass the station ranks in the public view, with other public buildings, and the stations of important towns are so large that it is necessary to supply to them the most perfect means of lighting. It is not less important for the railroads themselves where much night work is performed, especially in the moving of merchandise. If one observes, for a short time, the movements necessary in making up railroad trains, or of loading freight cars, the dangers to which employés are exposed will be apparent. At night, in the shadows produced by gas or petroleum lamps, the difficulties of the work are multiplied and the dangers greatly increased. In a report at the last session of the Congress, relative to electric lighting, it was said that at 16 ft. from the ordinary gas or petroleum lamps it is impossible to read an address on a package. In these conditions the gas lamps only aid employés to distinguish the different tracks without being obliged to carry lanterns. Experience shows that the work done at night is very much inferior to that done by day, and a considerable part of the difference may be attributed to insufficiency of lighting. The damages to material and goods are more numerous and important in handling by night than by day. Errors of shipment are also more frequent. The larger part of the robberies which occur in and about stations take place at night.

These considerations have induced, during the last few years, several of the railroad companies to light the large spaces, as well as the numerous tracks used for making up the trains, by means of powerful lights. There is already evidence of the advantages which result from this practice. For example: In the station of La Chapelle, M. Sartiaux says the employment of electric lighting has increased the employés' capacity for work from 1,200 to 1,500 pounds at night, against 1,900 during the day. M. Niels, station agent at Brussels, Allée-Vert, states that there is a diminution of 50 per cent. in the errors in consequence of lighting this station by large gas lights.

LIGHTING BY GAS.

The employment of intense gas lights is becoming more and more general, and the economy due to their use has been reported by the larger part of the companies. This economy is estimated at from 38 per cent. in the station at Hanover, to 69 per cent. by the Paris, Lyons & Mediterranean. Naphthaline carburetters with pressure regulators often give a great economy in the consumption of gas. Also the use of valves which permit of lowering the light of the lamps during the intervals between trains, and in freight stations when no work is going on. Beside this, economy has also been produced by a system of prizes distributed among the employés according to the saving produced. The Lyons Railroad estimate the reduction of the consumption of gas by lowering the flames at five-sixths, and the Midland Railway report a saving of three-fourths of the total consumption. The yearly consumption of gas can also sometimes be reduced by a better arrangement of the pipes. Gas has been substituted for oil in the more important stations, when the location is near gas works already erected. For large spaces gas has an advantage over mineral or vegetable oil in dispensing with a considerable force of employés required for the care of a large number of lamps. Although petroleum often costs less, especially in countries where coal is rarely found, in England the employment of gas appears general, but the price is also very low. In Belgium the State Railroad has extended the use of gas as much as possible. The Grand Central of Belgium, on the contrary, has all its stations lighted by petroleum. Even in England petroleum is used when gas cannot easily be obtained or when the price is dear. A comparison of the relative use of petroleum and gas is furnished by the following data: The Eastern of France has 21 stations out of 683 lighted by gas; the Paris, Lyons & Mediterranean, 115 out of 1,211; the French State road, 20 out of 248; the Western has a few of its large stations lighted by gas and all the others by mineral oil. This is also the case with the Mediterranean of Italy. It is very rare that railroad companies make their own gas.

In England there is a tendency more marked than on the Continent to make use of large burners. The economy of these large lights is particularly noted by the greater number of the railroads. The Belgian State Railroad says in order to increase the intensity of the light an apparatus for carburetting with naphthaline has been used. In certain cases gas carburetted by means of liquids placed in the carburetters has also been used. These carburetters are placed immediately by the side of the gas meters. These last are especially applicable where the price of gas is high. The direction of the German Railroads at Hanover uses sometimes ordinary gas enriched with one per cent. of oil gas prepared for lighting the cars. The light is increased one-third. Regulators which maintain a constant pressure, and therefore constant consumption of gas independently of fluctuations in the street mains, produce a considerable economy while improving the light. There are a great number of such systems. While the Wurtemburg State Railroad prefers to place the regulator at each burner, the Belgian State Railroad, having tried the different known systems, proposed to make general use of the Stott mercury regulator which is placed by the side of the gas meter. Only one regulator is necessary for a number of meters. The French State Railroad has adopted the Grangeon regulator, and by its use a saving of $1\frac{1}{10}$ cub. ft. per hour at each burner is effected. The Eastern of France makes use of Giroud's glycerine rheometre and of that of Bablon, which are placed at each burner, as well as the Giroud regulator attached to the meter. The English railroads employ Stott's regulator, and they speak very particularly of the advantage of using this kind of apparatus. As in the case of oil lighting, a system of prizes for economy effects a great saving in consumption. The Hungarian State Railroad has very carefully worked out a system for the determination of the normal consumption of gas in its burners and gives a prize of 50 per cent. of the value of the gas saved. The prize is divided into six parts, of which three are given to the person in charge of the station, two parts to the principal employés, and one part to the watchman, lamp-trimmers, etc.

LIGHTING BY ELECTRICITY.

Lighting by electricity has been greatly extended in the last few years wherever there are large spaces which it is necessary to light well, especially for night work requiring continuous lighting for a long time. To-day nobody doubts the great advantages which powerful electric lights offer for the lighting of large open spaces, and in general all areas where a very large quantity of light is required. These advantages also exist in a certain degree for the large gas lights which have already been mentioned, but the lighting power of these last rarely reaches 300 candles, while electricity permits the convenient employment of lamps of from 400 to 5,000 candles, and in light-houses even up to 10,000 candles, which can be placed at any height desired. It is also well known that a large quantity of light is most economically obtained from the more powerful lamps. Incandescent lamps are only one-tenth as economical as arc lamps of 1,000 candle-power. The cost of the electric light has a special importance, because it is often the increase of expense which decides whether to adopt or reject this kind of lighting, and when once a system is established, there should be a very serious reason for changing it. This cost bears a direct ratio to the yearly number of hours of lighting. According to the calculations of M. Decker, of Nuremburg, the electric lights cannot be economically used except where at least 2,000 hours of lighting per year are required. If 2,000 hours or more per year are required, electricity can compete with gas, if the price of the latter exceeds $1.13 per 1,000 cub. ft.; gas is the more economical when its price is below $0.68 per 1,000 cub. ft.

In Germany electricity is in use or has been tried in more than 40 stations, of which the most important are Strasbourg (which has 70 arc and 100 incandescent lamps), Carlsruhe (24 arc and 250 incandescent lamps), Darmstadt (17 arc and 170 incandescent lamps), Scheldt (59 arc lamps), Munich (47 arc lamps), Hanover (24 arc lamps).

In England the most important installations of the electric light which have been made for this purpose are the Tilbury Docks and the stations of St. Enoch, Glasgow, Paddington, etc. In the Liverpool street station of the Great Eastern Railway electricity supplements the lighting by gas.

In Austro-Hungary data have been published relating to two stations lighted by electricity, viz.: Budapest and Feldkirch. It is believed that are but three others, those of the State Railroad, the Sudbahn and Westbahn in Vienna.

The State Railroads of Belgium have 17 installations, comprising 163 arc and 322 incandescent lamps. The Grand Central of Belgium has lighted the station of Lodelinsart with electric arc lamps since 1882.

In France its use is more rare. The principal ones mentioned are the freight station of La Villette and the passenger station of the Eastern at Paris; that of La Chapelle Triage by the Northern; a *part* of the stations at Paris and Marseilles, and the stations at Bellegarde and Laroches-Foron by the Paris, Lyons & Mediterranean.

In Italy electric lighting is employed in two stations at Milan, one each at Turin, Sampierdarena, Genes-Place-Principe, Pisa and Rome.

In general, arc lamps are used for the lighting of large areas, both open and covered. Apparatus using continuous currents is preferred, because even without reflectors these lamps throw the larger part of their rays downwards. Where alternating currents are used it is because these installations are already in operation and the expense of changing would be considerable. Many different kinds of arc lamps are in use for railroad purposes, among which may be mentioned those of Siemens, Piette and Kusik (in Germany, Austria and Italy), Gramme and Cance in France, Crompton and Brush in England, Jaspar, De Puydt and Dulait in Belgium, etc.

Incandescent lamps are usually Swan or Edison. The height and distance apart of the lamps at the different stations reported varies greatly. For example, at Liverpool street station Brush lamps of 2,000 candle-power are placed 13 ft. high and 115 ft. apart; at the Sampierdarena, where the tracks used in making up trains are lighted, Siemens lamps of 9,400 candles are 13 ft. high and 100 or 130 ft. apart, and at Strasbourg the Siemens lamps are placed 65 ft. high, and at Schaerbeek 128 ft. high.

It is very difficult to procure data of the cost of installations or maintenance of electric lighting. Some of those reported in detail are given below: Fifteen Brush and 15 Cance lamps, fed by a Brush machine in the station of La Villette, cost $32,000, but this includes a second Brush machine in reserve. At the Lodelinsart station electricity was substituted for gas, as already mentioned, in 1882. The station is lighted by 5 Gramme lamps of 3,100 candles each, and 4 Siemens lamps of 440 candles, besides 16 incandescent lamps of 235 candles each, the power being obtained from the engine running the locomotive repair shops. The installation cost $8,922. Operating the lights for 3,650 hours per year cost $209.60 per lamp per year. Gas in 1882, before the adoption of electric lighting, cost $3,283. In 1886, the cost of lighting was $2,708, of which $140 was for gas. The lighting of the station was not only greatly improved, but the cost was materially lessened.

The Liverpool street station of the Great Eastern is lighted partly by gas and partly by electricity. Of 33 electric lamps, 27 are Brush lamps, placed 110 ft. apart. There are also 183 gas jets of 16 candle-power each. The cost per lamp was for electricity 6.4 cents, and for the gas 0.5 cent, supposing all the burners used. The cost of the electric lighting should be somewhat reduced, because the machines are used during the day for incandescent lighting in the offices. At Strasbourg station it is calculated that each arc lamp replaces 25 gas lamps, each burning 5.3 cub. ft. per hour, and each incandescent lamp replaces *one* gas lamp The total cost of each arc lamp is 5.75 cents per lamp hour, and each incandescent lamp 0.46 cent per lamp hour. Gas would cost 0.72 cent per lamp hour. There is, therefore, a very considerable economy in lighting by electricity at this station.

At Feldkirch the dynamos are operated by steam engines of 35 horse-power. Installation cost as follows: Buildings, $10,600; boilers and engines, $7,100; electric machinery, $9,150; lamps, $1,150; total $28,000. There are 24 arc lamps and 130 incandescent lamps of 16 candle-power. The cost of opeation for the arc lamps was $927, of which 35.7 per cent. was for wages and salaries, 31.1 per cent for fuel, 21.9 per cent. for miscellaneous expenses; repairs, etc., 11.3 per cent. The operation of the incandescent lamps cost $1,381, of which 40.7 per cent was for wages and salaries, 13.1 per cent. for renewals of the lamps, 29.50 per cent. for fuel, 15.1 per cent. for miscellaneous expenses, and 1.6 per cent. for repairs. The division of expenses among the arc and incandescent lamps was made in proportion to the motive power necessary, and was respectively 25.5 and 12.4 horse-power, or about two to one. If one arc lamp be taken equal to 15 incandescent lamps, the cost of operation per lamp hour is 0.39 cent.

THE SCRAP HEAP.

Too Many Straws to the Glass.

A car-load of smuggled liquor was seized at Newport, Vt., last week. What purported to be a load of straw was 56 cases containing 700 bottles of gin and brandy. It was shipped to Manchester, N. H., from St. Johns, P. Q., but was side-tracked and taken in charge by customs officials.

Universal Exposition of Barcelona.

On the 8th of April, 1888, there will be opened at Barcelona a universal exposition of agriculture, industry and the fine arts. This exposition will be under the authority of the municipal council of the city, and under the auspices of the Spanish government, with a directory or "General Council." Buildings have been erected expressly for it, and an area of 560,000 sq. yds. will be occupied by the buildings, gardens, etc. The exposition will continue six months. Foreign governments have been requested to appoint commissioners to represent them in the directory, and foreign exhibitors can communicate directly with the General Council of the exposition at Barcelona.

A Rear Collision.

"The new teacher is an old railroader," said Rollo, as he came home the first day. "How do you know?" asked Rollo's father. "Because," said Rollo, "he uses the interlocking switch on our terminals."—*Burdette.*

Collision on the Dutch State Railroad.

A London dispatch of Jan. 4 says a collision of express trains at Meppel, Holland, on that day killed 26 persons and injured a large number of others.

Old Engineers on the Erie.

There are 20 engineers on the Eastern Division of the Erie whose combined terms of service as such make a total of 550 years. The names of the men and the years of their service are as follows: John Ackerman, 25 years; A. P. Beatty, 23 years; S. Campbell, 31 years; Edson Coleman, 23; C. Frazier, 31; E. Kent, 39; A. Johnson, 30; J. N. Sarvent, 27; E. H. Cox, 25; D. Henderson, 30; S. S. Walker, 30; Benjamin Hafner, 37; S. Hammond, 23; B. Scribner, 23; H. C. Radcliffe, 23; J. H. Powles, 26; George Cooper, 27; Fred. Eldridge, 24; H. L. Carlough, 30; S. A. Ronk, 32.

The British Post-office and the Cables.

The London *Times* announces that it has been resolved to obtain for the British Post-office control of all telegraphic cables between Great Britain, France, Holland, Belgium and Germany, as soon as present concessions to the lines have expired. Contracts have already been signed with the Dutch, Belgian and German governments, and no difficulty has been experienced by the department except with France, and as regards the Submarine Telegraph Company's line. The Post-office has finally offered to buy the latter company's plant at an electrician's valuation, but will give nothing for good will, and it is predicted that with the control of this line under the Post-office there will be cheaper and better telegraphic communication between Great Britian and the continent. The Post-office is prepared to employ the best and most improved instruments, and every appliance that will secure rapid transmission. It is also probable that a central foreign telegraph station will be placed near the Bank of England. The news is received in commercial circles with approbation. It is also said that the Post-office will eventually take into its hands the telegraphing and receiving of all messages through all cables landing on British shores. The government denies some of the reports, but the *Times* reasserts their general correctness. The Submarine Company's concession will not expire until 1890.

Stealing Black Diamonds.

In Oneonta, N.Y., 53 persons were brought into court this week on the charge of stealing coal from cars while in transit over the Susquehanna division of the Delaware & Hudson Canal Co.'s roads. A large number of the offenders were boys and girls, children of reputable parents. Some of the older ones were also people of good standing, and above

the necessity of pilfering coal for the sake of keeping warm. The company has for a long time been aware of a systematic course of robbery being in progress, and the losses recently became so heavy that it was planned to leave three loaded cars standing for three days and nights on a side track at Oneonta, under surveillance of detectives, for the purpose of discovering the guilty people. During the three days nearly 10 tons of coal was stolen, and accordingly the wholesale arrests followed.

The 53 transgressors offered no defense in court. They were such a high-toned lot that their black offense seemed incomprehensible to the Judge. The thieves were too elegant for the penitentiary, so fines ranging from $2 to $25 were imposed, and these were cheerfully and quickly paid, the culprits congratulating themselves on the easy escape.

It almost seems like a delicate stroke of sarcasm on the coal barons, when members of our first families treat coal with the deference that ordinary burglars show to diamonds.

State Purchase of Railroads in Russia.

Negotiations have been in progress for some time in Russia between the Minister of Finance and several railroad companies with the view to the purchase by the State of the properties of these companies. It is said, however, that negotiations have now been suspended because the Imperial treasury is not in position to carry out the purchase. The Government will take possession Jan. 1, 1888, of the Riaiska-Morchausk line, at a guaranteed rental of 5 per cent.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulations of Railroads.

In West Virginia, a person conveyed land to the C. & O. Railroad Co. for $1,000, with a consideration that if the property should cease to be used for railroad purposes by the company, it should revert to the grantor. There was also a covenant that the grantor was to have leave to connect a branch with the track at a point near his hotel, and that the company would erect fences and protect the track. The C. & O. Railroad Co. was sold to the C. & O. Railway Co. under foreclosure proceedings. The Supreme Court of the United States holds that the second company cannot be compelled by law to run its road through the grantor's land.[1]

In Kentucky a railroad company had legislative power to acquire property absolutely for other than mere right of way purposes. A deed to it was headed "Deed of Right of Way." It recited a consideration of $2,150, for which the grantors "hath given, granted, bargained and sold, and by these presents do give, grant, bargain and sell to" defendant "so much of his lands in said county as is required for the use of the road of said company, as follows," containing 2.7 acres of land; "to have and to hold to said grantees and their assigns forever." Then came a covenant to warrant and defend the premises granted, and relinquishment of dower by wife. One description of boundary recites, "East edge of right of way." The land conveyed was not of uniform width. The Court of Appeals holds that the railroad took the fee in the land and not a mere easement or right of way.[2]

In Iowa, the Supreme Court decides that a railroad company, lawfully constructing its road upon the bed of a navigable stream, thereby precludes riparian owners from acquiring title by accretion to land so formed, and lying between the land appropriated by the railroad and the new high-water mark of the river; also that a railroad company, constructing its tracks upon land below the ordinary high-water mark of a river declared by act of Congress to be a navigable stream, thereby acquires a title, as against adjoining riparian owners, to the full width of land actually appropriated by its embankments, under Iowa code, which was in force at the time of such appropriation, and which provided that "any railroad corporation shall be authorized to pass over, occupy and enjoy, without payment of damages, any of the school, university and saline or other lands of this state: provided, no more of such lands shall be taken than is required for the necessary use and convenience of such corporation."[3]

The Supreme Court of New Hampshire rules that the New Hampshire statute prohibiting the running of railroad trains at a greater rate of speed than 6 miles an hour across a highway in or near the compact part of a town is applicable to railroads which extend into an adjoining state, as well as to those which are wholly within the state.[4]

Construing an Illinois statute, the Supreme Court of that state holds that it does not authorize a new railroad company to condemn under eminent domain law the right of way of another railroad company for the purpose of building thereon another parallel line.[5] In the same state the Supreme Court decides that where a railroad company was notified by the adjoining proprietor to enclose its right of way, in accordance with the statute, it was its duty to build on the line between it and the adjoining proprietor; and where in assuming to comply with the notice, it placed its fence ten feet within its right of way, a writ of mandamus was a proper remedy to compel compliance with the duty.[6] In Iowa, it is ruled by the Supreme Court that crossings become a part of the railroad itself, to which individuals and the public have rights that cannot be defeated by changes of ownership of the railroad, brought about by judicial sale or otherwise.[7]

In North Carolina, A has been using a "lead ditch" which ran across his own and the adjoining land of B. A portion of B's land, with a section of the ditch, was condemned to the use of a railroad, and, in using the ditch to drain its surface water, the volume of water was increased beyond the capacity of the ditch to remove, and the water upon A's land, not having sufficient outlet, was dammed back upon his land. The Supreme Court decides that as A had no easement in the drain upon B's land, the railroad was not liable to him for the damages arising from its rightful use of the ditch. The principle of law laid down by the Supreme Court is that on the condemnation of land for a railroad, everything necessary and incident to the original making and subsequent operating of the road passes as against the owner of the condemned land; and the use by it of a drain running across the condemned land and plaintiff's land, for the drainage of excessive surface water, is incident to the successful operation of the road, and is rightful, though such use may work damage to plaintiff.[8]

In New Jersey, the Chancellor refuses an injunction to effect the removal of a large and expensive railroad embankment erected on soft land and which complainant claimed had caused an upheaval of his contiguous lane and had greatly injured the house thereon, it appearing probable that the injury was complete and that no additional damage would accrue, and the complainant having an adequate remedy at law.[9]

The Alabama Constitution provides that "municipal and other corporations * * * invested with the privilege of taking private property for public use, shall make just compensation for the property taken, injured or destroyed by the construction or enlargement of its works, highways or improvements, which compensation shall be paid before such taking, injury or destruction." The Supreme Court holds that where a railroad corporation had condemned land, and subsequently, after the tract of which the condemned strip was a part had been platted into a town, erected an embankment along the strip which the plat left as a public street, that such structure was an "enlargement," within the meaning of the constitution, and that an abutter, who had bought of the original proprietor, "injured" thereby, might enjoin the company until compensation was made or security given for its payment.[10]

In several cases in Indiana, the Supreme Court construes the statutes of the state relative to fencing against cattle.[11] In Iowa, in an action for killing a mule it appeared that the plaintiff's teamster had put the mule in plaintiff's stable near the track, fed it, and gone away for about 20 minutes, leaving the door open and the mule unfastened, to allow it to go to a watering place near by to drink. During his absence, the mule wandered onto the track, and was killed by the negligence of the persons in charge of the train. The Supreme Court holds that the mule was not running at large with the permission of the owner, within the meaning of an ordinance providing that "it shall be unlawful to permit any mules * * * to run at large upon any of the streets" of the city, and that the plaintiff was not guilty of contributory negligence.[12]

Carriage of Goods and Injuries to Property.

An Iowa statute prohibits common carriers from receiving for transportation intoxicating liquors. The plaintiff was the manufacturer of a beverage which he claimed was non-intoxicating, and which he called "New Era Beer," applied for a mandamus to compel a railroad to transport this commodity for him. The Supreme Court refuses the writ on the ground that, as "beer" is one of the liquors which the prohibition law especially concerns, the defendant had a right to refuse anything called beer, and was not compelled to analyze it to find out whether it was intoxicating or not; *i. e.*, whether he could safely carry it or not.[13]

The Court of Appeals of New York has rendered an important decision as to the delivery of goods by a carrier to the wrong person. The law, it says, will allow of no excuse by the carrier for a wrong delivery except the fault of the shipper himself. It is the duty of the carrier to ascertain if there was a bill of lading delivered to the shipper, and, if so, to retain the property until demanded by one claiming under it. Where the information which the carrier procured as to the consignee was of a doubtful nature, so far as the transfer sheet to it was concerned, it was a negligent act to deliver the goods to persons named in the transfer sheet who did not plainly appear to be the consignees. A carrier should deliver in accordance with the bill of lading; and if the goods are delivered without it, the carrier runs the risk of showing a delivery in accordance with its directions. A direction to the carrier in a bill of lading, to notify certain persons to whom, if consignees, it was the carrier's duty to deliver, or at least to notify of the arrival of the goods, is a notice, in the absence of further directions, that they are not the consignees. Where no one is named as consignee in a bill of lading, no delivery should be made to any one who does not produce it.[14]

In Iowa, it is held by the Supreme Court that the liability, as a common carrier, of a railroad company transporting grain, commonly and most conveniently removed directly from the cars instead of through a warehouse, does not cease until the car is placed in a safe and convenient location for unloading; and the finding of a jury that a car was so placed that it could but with difficulty be unloaded, justifies a verdict holding the company liable as a common carrier.[15]

In Michigan, the plaintiff gave shipping orders to the defendant for the shipment of property to a point known by the plaintiffs to be off the defendant's line of road. By the terms of the contract of shipment, the defendant agreed to deliver the property "with as reasonable dispatch as their business would permit, subject to the conditions mentioned below, in like good order, at —— station, upon the payment of charges." The company further agreed "to forward the property to the place of destination as per margin, but not to be held liable on account thereof after the same shall be delivered as above." The Supreme Court decides that this was a contract to deliver the property at any point that might be selected by the company, upon its line of road, most convenient for forwarding to its place of destination, and not for through transportation. The Court also holds that where the terms of a contract for the shipment of goods by a railroad company, to a point not upon the line of its road, specify that the property shall not be delivered except upon a bill of lading, the delivery of the goods by such company to one of its connecting lines, to be forwarded, accompanied by the necessary information regarding the delivery, relieves the company of any liability for its delivery without the presentation of the bill of lading.[16]

Injuries to Passengers, Employes, and Strangers.

An injury of likely recurrence to any passenger on a suburban train where people carry many packages into the cars has just been before the New York Court of Appeals. A passenger reading his newspaper in his seat was suddenly interrupted by a blow on the head which stunned him and injured him quite badly. The blow came from an iron clothes wringer which had fallen from a rack next his seat, and had been placed there by another passenger. The wringer was wrapped in paper, and neither the conductor who had passed through the car collecting tickets, nor any one else saw anything about the package to cause remark—it might have been a bundle of clothes for all one could tell from the outside. The injured passenger sued the railroad for damages, and obtained a verdict for $2,500. This verdict the Court of Appeals sets aside, holding that there was no ground on which to make the company responsible for the accident. "It seems quite clear," say the Court, "that there was nothing extraordinary about the parcel or its position in the rack, and nothing to attract particular attention to it; and so the failure of the train hands to notice it, or if noticed to order its removal, was not negligence."[17]

In Alabama, where a passenger purchased a ticket to his destination and was directed by an agent of the road at the station to the wrong train, which took him beyond his destination, the Supreme Court sustains a verdict in his favor of $200 against the railroad.[18] In Mississippi a verdict against a railroad for failing to stop a train at the station to which the plaintiff had purchased a ticket is sustained by the Supreme Court.[19]

The Supreme Court of Indiana holds that a conductor, as the representative of a railroad company, has neither actual nor ostensible authority to instruct one who, holding a ticket upon the railroad, has by mistake entered the wrong train, and who, in accordance with his advice, leaves the train, as to what path or road he should walk to reach a distant station, to secure a place upon the proper train on the same road, proceeding in a contrary direction; and the railroad company is not responsible for the accidental killing, by a passing train, of such person while upon its track in pursuance of such instruction.[20]

The Supreme Court of the United States decides that a railroad is not obliged to stop a train between stations to recover a hand bag which a passenger in attempting to lower the sash dropped out of the window. The passenger in this case was a woman on a train in Louisiana, and the bag contained nearly $6,000 in bank bills, and jewelry worth over $4,000. She told the conductor as soon as it fell out of the window its great value and asked him to stop the train and let her off. He refused and when they arrived at the next stopping place she at once sent in search of it, but it was never recovered. She therefore sued the railroad, but the Supreme Court holds that she cannot recover.[21]

In Indiana, a switchman, quite familiar with the location, was walking westward on the track, or between the tracks, toward a switch standard located in the space between the tracks, which he was about to move; and when he had reached the standard he was struck by the rear car of a train of four cars backing from the eastward at the rate of about four miles an hour, with the bell ringing, and fully equipped with men, and with a brakeman stationed at the end of the rear car as a lookout, who, observing the deceased and believing that he saw the train, which was in view for 142 ft. before reaching the standard, did not give him any special warning. The Supreme Court holds that the lookout was not chargeable with negligence, but the deceased was so chargeable, and there could be no recovery by his administrator against the railroad company.[22]

In Michigan, the plaintiff, a car repairer in the employ of defendant, brought suit for the recovery of damages for injuries received while in performance of his duties, and which he alleged were the result of the defendant's negligence in not providing for the safety of the car repairers, whose duty it was to work under the cars while standing upon the track. There was introduced in evidence a general order of the defendant directing all car-inspectors and repair-men, before going between or under any cars, to place the red signal flag on the end of the car or cars in the direction from which a train or engine could approach, and all trainmen were ordered not to back against or couple onto any car while such signal was displayed. The foreman in charge had placed the flag upon the forward end of the train under which plaintiff was at work, but another train, consisting of about 30 cars, was afterward left upon the same track ahead of and a short distance from it. The foreman did not change the flag to the forward train, in consequence of which the train was subsequently coupled to a switch engine, and six of its cars were run out upon another track, where one of them was left. In running the remaining five back upon the repair track they became unmanageable through the negligence of the man in charge of the switch-engine in pulling the coupling pin while the cars were in motion, and they were impelled against the cars that had been left standing, and drove the latter against the train under which plaintiff was at work, resulting in injury to plaintiff. The Supreme Court decides that the general order of defendant, if enforced and respected, was sufficient protection to plaintiff and others similarly employed, and that the injuries were the result of the negligence of the plaintiff's fellow employés, the foreman and the engineer, and that, as there was no evidence that these men were incompetent, the defendant could not be charged with the results of their negligence.[23]

In Iowa, a railroad was sued for the death of a brakeman in its employ, occasioned by his foot being caught in the space between the main and guard rails of the track. There was no evidence tending to show that the block in such space was improperly placed, or so placed as to be dangerous to employés; but the evidence did tend to show that the block was worn, and a portion of it split off, caused by the operation of the road. The Supreme Court rules that the railroad is not liable.[24]

In Iowa, an employé in the car shops of the defendant corporation was directed to assist in removing screens from the cars of a passenger train, while the train should be standing at the station. Acting under the foreman, he placed a ladder against the cars, and had just mounted it, when the train started back, throwing down the ladder, and injuring him. The Supreme Court holds that there was evidence against the company tending to show negligence, either on the part of the trainmen in not giving warning of the movement of the train, or on the part of the foreman in not notifying those in charge of the train that the plaintiff was to ascend the car, and they sustain a verdict against the company.[25]

A man was in the employment of a railroad in New Mexico in actual possession of a certain line of road. Another railroad company, represented by an armed body of men, attempted to drive away the agent and servants of the former company and in the attempt the man was injured. He knew of the threatened attack and he and his co-employés had armed themselves to resist it. The Supreme Court of the United States holds that the attacking railroad is liable in damages, without regard to the question of title or right of possession of the road.[26]

In Michigan a car coupler was coupling cars standing on a short curve. The draw-heads failed to meet and passed each other allowing the cars to come so close together that he was crushed to death. It appeared that he was standing on the inside of the draw-bar, and that the outside was free from danger. The Supreme Court of the United States decides that the railroad is not liable.[27]

The Supreme Court of Iowa decides that the section of the Code of that state (§ 1307) making railroad companies liable for injuries to an employé caused by the negligence of a co-employé, is not such special and partial legislation as to be in violation of the fourteenth amendment to the constitution of the United States.[28] This statute provides that railroads shall be liable to employés for injuries caused by the negligence of co-employés, when the "negligence is in any manner connected with the use and operation of any railway on or about which they shall be employed." Construing these words, the Supreme Court holds that it is immaterial that the plaintiff was not employed in the operation of the road, so long as he was injured by its operation, and by the negligence of one or more who were charged with responsibility with respect to the movement of the train.

In Michigan, it is held by the Supreme Court that a railroad company is under no legal obligation to maintain a station agent at a flag station, where there is an unblocked siding, for the protection of its employés. All that is required of it is that it construct and "equip its side tracks and cars, and station its agents in the manner usual with well managed railroads, and as good railroading requires." It is not bound to change its manner of using its side tracks, nor to adopt the most approved ways or appliances in business; and if one of its servants, knowing, or having ample means of knowing, from long-continued employment, the way and manner in which the side tracks are used, continues in the employment without complaint, and if, from such way and manner, he is subjected to risks of accident, he is presumed to assume such risks, and, if injured thereby, cannot recover.[29] In Minnesota, the Supreme Court says that it is the duty of a railroad to cover culverts on the line of its road in its yards, and within a reasonable distance of switches, wherever it would naturally be anticipated that brakemen in the proper discharge of their duties would be apt to go in making couplings.[30]

In Tennessee, a section boss was injured through recklessly running his hand-car through a deep cut, without sending any one ahead to watch for or signal a passenger train then about due. The Supreme Court of the United States rules that he cannot recover damages.[31]

In Virginia, a man was riding in his carriage with the top up. When near a railroad crossing he slowed his horse to a walk. The track at that point was straight, and the the deceased at 25 yards from the track, and until reaching it, had a view of it for miles. He did not look out until the horse was on the track. He then attempted to hurry the horse across in front of the train, but failed, and was killed. The testimony as to the whistling was conflicting. The Supreme Court of Appeals holds that the man was guilty of

such contributory negligence as to bar any recovery against the railroad for his death.[32]

In New York the Court of Appeals decides that where a person was struck at a railroad crossing, with which he was familiar, and there injured by a car moving slowly, at not over four miles an hour, in a bright, clear day, when nothing existed to obstruct or hinder the sight, when he, being on foot, could have stopped at any instant, and when the merest glance would have developed the approaching danger, and the facts make it certain that he did not look or looked and saw the car and undertook to cross in front of it, contributory negligence is shown, and he cannot recover damages. It was no excuse, says the Court, for not looking, that his attention was directed by the passage of a train on another track south of where he was and by the movements of some coal dumps on a side track, where the cars and dumps did not menace his safety or affect his action. To be an excuse the object or cause which so diverts his attention must be something which can justify, consistently with prudence, the withdrawal of attention from the near and imminent danger; otherwise it is mere needless curiosity.[33]

In Indiana, the Supreme Court rules that where a railroad company changes the face of a highway for its own convenience, it is not bound to make it safer for travelers upon it than its use for a railroad will permit, and one who walks upon it is bound to know that it is a railroad track, and is not safer for use for passage than the object for which it is devoted will allow; but there may still be a recovery where the unsafe condition of the track is due to the negligence of the company, and the plaintiff, while using such care as a prudent and careful person of adult age would use in making his way along a track traversing the street, had his foot caught in the track, and the railroad company was negligent in managing its train, and by reason thereof the plaintiff was injured.[34]

1 Hoard v. C. & O. R. Co., 8 S. C. Rep., 74.
2 Ballard v. Louisville & N R. Co., 5 S. W. Rep, 484.
3 C., B. & Q. R. Co. v. Porter, 34 N. W. Rep., 286.
4 Clark v. B. & M. R. Co., 5 N. Eng. Rep., 48.
5 Ill. Cent. R. Co. v. C., B. & N. R. Co., 11 West. Rep., 133.
6 O. & M. R. Co. v. Lyman, 11 West. Rep., 375.
7 Swan v. B., C. R. & N. R. Co., 24 N. W. Rep. 457.
8 Willey v. Norfolk S. R. Co., 3 S. E. Rep., 485.
9 Herbert v Penn. R. Co., 9 Cent. Rep., 322.
10 Columbus & W. R. Co. v. Witherow, 3 South. Rep. 23.
11 Hunt v. L. S. & M. S. R. Co., 11 West Rep., 107; Pennsylvania Co. v. Dunlap 11 West Rep., 87; Pennsylvania Co. v. Spaulding, 11 West Rep., 98.
12 Doran v. C., M & St. P. R. Co., 34 N. W. Rep, 619.
13 Milwaukee Malt Extract Co. v. C., R. I. & P. R. Co., 34 N. W. Rep., 761.
14 Furman v. Union Pac R. Co., 9 Cent. Rep., 285.
15 Independence Mills Co. v. Burlington, C. R. & N. R. Co., 34 N. W. Rep, 320.
16 Rickerson Roller-Mill Co. v Grand Rapids R. Co., 34 N. W. Rep 269
17 Morris v. N. Y. Cent. & H. R. R. Co., 9 Cent. Rep., 288.
18 Alabama G. S. R. Co. v. Heddleston, 3 South. Rep., 53.
19 Dorrat v. Ill. Cent R. Co., 3 South Rep., 36.
20 Cinn., H. & D. R. Co. v. Casper, 11 West. Rep., 221.
21 Henderson v. L. & N. R. Co., 8 S. C. Rep., 60.
22 C., I. & St. L. & C. R. Co. v. Long, 11 West. Rep., 322.
23 Peterson v. C. & N. W. R. Co., 34 N. W. Rep., 260.
24 Griffith v. B., C. R. & N. R. Co., 34 N. W. Rep., 609.
25 Pierce v. I. C. R. Co., 34 N. W. Rep, 783.
26 Denver & R. G. R. Co. v. Harris, 7 S. C. Rep., 1287.
27 Tuttle v. D., G. H. & M. R. Co., 7 S. C. Rep., 1166.
28 Pierce v. Cent. I. R. Co., 34 N. W. Rep., 783.
29 Hewitt v. F. & P. M. R. Co., 34 N. W. Rep., 660.
30 Franklin v. M. & St. P. R. Co., 34 N. W. Rep., 898.
31 Goodlett v. L. & N. R. C., 7 S. C. Rep., 1254.
32 N. Y., P. & N. R. Co. v. Kellam 3 S. E. Rep., 703.
33 Woodard v. N. Y., L. E. & W. R.,
34 Louisville, N. A. & C. R. Co. v. Phillips, 11 West. Rep., 119.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings of the stockholders of railroad companies will be held as follows:

Georgia Company, annual meeting, at the office, High Point, Guilford County, N. C., Jan. 10.

Manhattan, special meeting, at the office, New York, Jan. 10.

West Virginia & Pittsburgh, annual meeting, at the office, Baltimore, Jan. 24.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Atchison, Topeka & Santa Fe, quarterly, $1.75 per share, payable Jan. 10.

Beech Creek, 2½ per cent. on preferred stock, payable Jan. 16.

Canadian Pacific, semi-annual, 3 per cent., payable Feb. 15.

Canada Southern, 1¼ per cent., semi-annual, payable Feb. 15.

Chicago, St. Paul, Minneapolis & Omaha, 3 per cent. on preferred stock, payable Jan. 20.

Delaware, Lackawanna & Western, quarterly, 1¾ per cent.

Lake Shore & Michigan Southern, 2 per cent., semi-annual, payable Feb. 15.

Michigan Central, 2 per cent., semi-annual, payable Feb. 15.

St. Louis, Vandalia & Terre Haute, semi-annual, 3 per cent.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *New England Railway Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The Western Railway Club meets in Chicago the third Wednesday in each month.

The *Engineers' Club of St. Louis* meets the first and third Wednesday of each month till June.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *General Time Convention*, semi-annual meeting, will be held in New York, April 11.

The *National Association of General Baggage Agents* holds its seventh annual convention at the Grand Pacific Hotel, Chicago, Jan. 18.

The *National Association of General Passenger and Ticket Agents* holds its annual meeting in St. Augustine, Fla., on March 20.

The *Traveling Passenger Agents' Association* holds its annual meeting in Jacksonville, Fla., on Jan. 10.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The *Ohio Society of Surveyors and Civil Engineers* will hold its ninth annual meeting in Lyndon Hall, Columbus, O., on Jan. 10 11 and 12

The *Connecticut Association of Civil Engineers* will hold its annual meeting in Hartford on Jan. 10.

Engineers' Club of Kansas City.

The first annual meeting of the club was held Dec. 19. Reports of the executive committee and officers were read and approved. The offices of secretary, treasurer and librarian were combined and nominations for officers for the year were made. Mr. Waddell read selections from his general specifications for highway bridges, and requested that the club indorse the objects of the paper. The President was directed to appoint a committee of three to consider the advisability of such action. The committee appointed were Messrs. Chanute, Breithaupt and Mason. From the report of the Secretary, it appears that the club now has a membership of 46. The first meeting was held Jan. 8, 1887, and the organization completed Feb 5. There were 35 charter members. There have been 14 additions, 2 resignations and 1 death.

Master Car Builders' Association.

The Secretary, M. N. Forney, 45 Broadway, has issued the following list of subjects on which reports are to be made at the next annual convention, which is to be held at Alexandria Bay, N. Y., June 12, 1888. The names and addresses of the members of the several committees are also given.

1. Standards and Appliances for the Safety of Trainmen.—This Committee was instructed to report some definite recommendations next year. Committee: H. Hegewisch, U. S. Rolling Stock Co., 35 Wall St., N. Y.; John Kirby, Lake Shore & Mich. Southern, Cleveland, O.; M. N. Forney, 45 Broadway, New York.

2. Automatic Freight-Car Brakes.—Committee: Godfrey W. Rhodes, Chicago, Burlington & Quincy, Aurora, Ill.; Geo. Hackney, Atchison, Topeka & Sante Fe, Topeka, Kan.; B. Welch, Central Pacific, Sacramento, Cal.; John S. Lentz, Pa. & New York Canal & Railroad Co., Packerton, Pa.; W. T. Hildrup, Harrisburg Car Co., Harrisburg, Pa.

3. The Best Form and Construction of Car Roofs.—Committee: J. D. McIlwain, Grand Trunk Railway (G. W. Div.), London, Ont.; Samuel Irvin, Missouri Pacific, St. Louis, Mo; L. Packard, N. Y. Central & Hudson River, West Albany, N. Y.; Wm. Forsyth, Chicago, Burlington & Quincy, Aurora, Ill.

4. Car Heating.—Committee: Frank L. Sheppard, Pennsylvania, Altoona, Pa.; R. D. Wade, Richmond & Danville, Washington, D. C.; Robert Miller, Michigan Central, Detroit, Mich.

5. Wheels.—This Committee was appointed to confer with a committee appointed by wheel manufacturers. Committee: J. N. Barr, Chicago, Milwaukee & St. Paul, Milwaukee, Wis.; John Kirby, Lake Shore & Michigan Southern, Cleveland, O.; George F. Wilson, Minn. & St. Louis, Minneapolis, Minn.

6 Journal Lubrication, and the Best Practice for Economizing Oil.—Committee: J. W. Cloud, New York, Lake Erie & Western, Buffalo, N. Y.; H. Roberts, Chicago & Grand Trunk, Detroit, Mich.; J. N. Lauder, Old Colony, Boston, Mass.

7. The Best Form of Door Hangings, including Grain Doors.—Committee: E. W. Grieves, Baltimore & Ohio, Baltimore, Md.; John P. Levan, Pennsylvania, Altoona, Pa.; John Voorhees, Indianapolis Car Manufacturing Co., Indianapolis, Ind.

8. How Can Uniformity in the Interchangeable Parts of Cars be Obtained.—Committee: Sam'l Irvin, Mo. Pacific, St. Louis, Mo.; James McGregor, Michigan Car Co., Detroit, Mich.; John Hodge, Chicago, Santa Fe & California, Streator, Ill.

9. Committee of Arbitration in Disputed Cases under the Rules of Interchange.—Committee: Wm. Buchanan, New York Central & Hudson River, Grand Central Depot, New York, N. Y.; Robert C. Blackall, Del. & Hudson Canal Co., Albany, N. Y.; G. W. Cushing, Phila. & Reading R. R., Reading, Pa.

10. Subjects to be Reported at the next Annual Convention for Investigation and Discussion at the Succeeding Convention.—Committee: Joseph Wood, Penna Co., Pittsburgh, Pa.; Wm. McWood, Grand Trunk Ry., Montreal, Canada; E. B. Wall, Pitts., Cinn. & St. L. R. R., Columbus, O.

11. Committee of Arrangements for the Next Annual Convention.—Committee: R. C. Blackall, Delaware & Hudson Canal Co., Albany, N. Y.

American Society of Civil Engineers.

A regular meeting was held Jan. 4, President W. E. Worthen in the chair. The following members and juniors were elected:

Members.—Channing Moore Bolton, De Clermont Dunlap, Henry Holbrook Gladding, Arthur Haviland, Camile Stanislaus d'Invilliers, Charles Hees Ledlie, Henry Benjamin Patten, Frederick John Henry Rickon, John Muirhead Stewart, George Francis Wright.

Juniors: Julius LeRoy Adams, Francis Henry Bainbridge, Eugene Carroll, Russell Wadsworth Hildreth, Alexander Edward Kastl, William Anthony Lydon, Alexander Potter.

NORTH RIVER BRIDGE.

Mr. Gustav Lindenthal read a paper describing a proposed suspension bridge over the Hudson River.

The proposed dimensions are: River span, 2,850 ft.; two shore spans, 1,800 ft. each, or 6,450 ft. in all; width, 68 ft., to carry six railroad tracks. The towers, which are to be of iron columns, composed of plates and angles, will be 490 ft. above water, and it is expected that the New York foundation will go down 175 ft. to rock.

The roadway is to be 145 ft. above the water at a temperature of 50° Fahrenheit, with an extreme range of 8 ft. due to the expansion and contraction of the cables, of which there are to be four. Mr. Lindenthal proposes, in order to prevent as far as possible uneven strains on the wires from progressive changes of temperature in cables as large as would be required, viz., 37 in. in diameter, to split the cable into four equal sized quadrants by the means of steel crosses. This will bring the diameter of each cable up to 4 ft., and they are to be covered with steel sleeves, which will leave an air space of 2 in. around the cables as a protection against the heating of one side of the cables by the sun.

It is understood that the plans and computations on which the paper was based were made for some capitalists who think a bridge should be built to accommodate the travel from the west side of the Hudson. The paper was very full, entering at some length into the various appliances for meeting wind and other strains, and discussing the strength of the bridge and the reasons for preferring a bridge to a tunnel and a suspension bridge to a cantilever.

On account of the lateness of the hour at which the reading was concluded there was no discussion.

ANNUAL MEETING.

The thirty-fifth annual meeting of the society will be held in New York, on Wednesday, Jan. 18, 1888, at 10 o'clock.

The annual reports will be presented, officers for the ensuing year elected, time and place for the next annual convention considered, reports of standing committees presented, proposed amendments to Constitution and By-laws discussed, and other business transacted.

It is expected that the business of the meeting will be transacted during the first day; a lunch will be served at the Society House. Arrangements for the evening of Wednesday, Jan. 18, and for the day and evening of Thursday, Jan. 19, will be perfected by a committee, and will include visits to points of interest and a dinner or social reception.

The following are the names of persons selected as candidates for officers by the nominating committee, appointed at the last Annual Convention:

For President: Thos. C. Keefer.
For Vice-Presidents: J. James R. Croes, Robert Moore.
For Secretary and Librarian: John Bogart.
For Treasurer: George S. Greene, Jr.
For Directors: Mendes Cohen, Joseph M. Wilson, Stevenson Towle, Charles B. Brush, Alphonse Fteley.

New England Railroad Club.

The regular monthly meeting of the club will be held on Wednesday, Jan. 11, 1888. Subject for discussion, "Frogs and Safety Switches." The Chief Engineers, Roadmasters and Trackmasters of roads in Boston and vicinity are cordially invited to be present.

PERSONAL.

—W. E. Chamberlain has resigned the position of General Superintendent of the South Atlantic & Ohio.

—Mr. John Player, formerly mechanical engineer on the West Shore, has taken charge of the drawing office of the Brooks Locomotive Works.

—Daniel W. Scullen, who died on Dec. 10, at his home at Creston, Ia., had served as locomotive engineer on the Chicago, Burlington & Quincy continuously for the past 30 years. This is said to be the longest record on that road.

—Moses Boyd, who is the subject of a sketch and portrait in the January *Pathfinder*, has probably served more years as conductor than any man in New England. He was born in Dedham, Mass., in 1815, and entered the service of the Boston & Providence in 1843. For 30 years Mr. Boyd made eight daily trips between Boston and Dedham, being the only conductor on the branch. For the past 41 years he has been accompanied by Engineer Prince.

— Major James Evans died at the residence of his son, Denver, Colorado, on Dec. 26 last.

The past twenty years of Major Evans' life have been passed west of the Missouri largely in locating and constructing roads in and through the Rocky Mountains. He located that part of the Union Pacific between Cheyenne and Rawlins, and had charge of construction as far west as Green River, under S. B. Reed, the Superintendent and Engineer of Construction. After the completion of the Union Pacific, Major Evans was Chief Engineer and afterwards Consulting Engineer of the International Railroad of Texas and induced the late H. M. Hoxie to go down there as Superintendent. Lately Major Evans has located and built some of the most difficult roads in Colorado.

ELECTIONS AND APPOINTMENTS.

Anaheim, Olinda & Pomona.—The directors of this new California company are: Edward Records, of Los Angeles; S. Littlefield, A. Goldthwaite, Louis Schorn, Henry Kroeger, Theo. Rimpau and Adolph Rimpau, all of Anaheim.

Atlanta & Great Western.—George T. Fry is President of this new Georgia company.

Baltimore & Ohio.—G. B. Hazlehurst has been appointed Engineer of Bridges and Tests.

D. H. Barrett has been appointed Chief Chemist in charge of laboratory at Mt. Clare.

Boston & Lowell.—The following directors were elected this week: Edwin Morey, T. J. Coolidge, E. E. Clark, Channing Clapp, W. P. Mason, A. Cochrane and W. A. Haskell.

Central of Georgia.—The following directors were elected this week: John C. Calhoun, Walter Luttgen, of New York; E. P. Alexander, Hugh T. Inman, Samuel M. Inman, J. J. Wilder, E. M. Green, Patrick Calhoun, C. H. Phinezy, J. K. Garnett, A. E. Mills, C. R. Woods, Abraham Vetsburg, of Georgia; and H. B. Hollins, of New York, one of the directors and First Vice-President of the Georgia Co., which is the incorporated syndicate controlling the Central. Henry Blun, of Savannah, retires and goes to the directory of the Ocean Steamship Co. Uriah B. Harold, of Georgia, retired to become President of one of the Central's branch lines, and to admit new members on the board. The Messrs. Inman and Mr. Luttgen are the three new directors.

Chicago, Burlington & Quincy.—W. J. McLean has been appointed Traveling Passenger Agent, with headquarters at Marshalltown, Ia., vice H. O. Webb, resigned. F. W. Irving has been appointed Traveling Passenger Agent, with headquarters in Boston.

Chicago, Kansas & Nebraska.—The Kansas City *Journal* announces that M. A. Low has been appointed President of this company, which is the Chicago, Rock Island & Pacific's line west of the Missouri River.

Cincinnati, Hamilton & Dayton.—W. H. Prouty has been appointed General Baggage Agent, office at Cincinnati.

Cincinnati, New Orleans & Texas Pacific.—J. L. William has been appointed Traveling Passenger Agent, office at Dallas, Tex.

Cleveland & Pittsburgh.—The following directors were elected this week: J. W. McCullough and B. F. Jones, of Pittsburgh; George B. Roberts and William Bucknell, of Philadelphia; Charles Lanier and W. C. Egleston, of New York; E. A. Furgeson, of Cincinnati; J. V. Painter, E. R. Perkins, R. P. Ranney and R. F. Smith, of Cleveland, and W. W. Holloway, of Bridgeport, O.

Delaware, Lackawanna & Western.—W. B. Murray has been appointed District Passenger Agent, office at Scranton, Pa.

Eastern.—The following board of directors was elected this week: Frank Jones, N. J. Bradlee, Arthur Sewall, Walter Hunnewell, Samuel C. Lawrence, Samuel C. Cobb, S. Endicott Peabody, Jarvis D. Braman and Joseph H. Gray.

Ellsworth & Limestone Valley.—Ira E. Lloyd, of Ellsworth, Kan., and others, are incorporators of this company.

Ferries & Cliff House.—The incorporators of this California company are: Wm. J. Adams, of Menlo Park; Jno. Ballard, of Alameda; Wm. H. Martin, Thos. Mayall and Henry H. Lynch, of San Francisco.

Fort Worth Western.—The following directors were elected last week: W. W. H. Lawrence, C. L. Frost, E. A.

Morse, Max Elser, E. M. Alvord, J. P. Smith, Martin Casey, M. R. Kiley and Isaac Dahlman. The directors elected W. W. H. Lawrence, President; C. L. Frost, First Vice-President; E. A. Morse, Second Vice-President; Max Elser, Treasurer; and E. M. Alvord, Secretary.

Georgia Midland.—J. E. Graniss has been elected a director in place of J. W. Woolfolk, resigned.

Illinois Central.—W. E. Keepers has been appointed First Assistant General Freight Agent at Chicago, and W. R. Bascom, Assistant General Freight Agent of the lines in Iowa. George M. Nix, W. S. Benson, W. M. C. Kinney, B. E. Nichols and L. L. Mosely are named as Traveling Freight Agents.

Indiana, Bloomington & Western.—O. P. Anderson has been appointed General Agent, with headquarters at Peoria, Ill.

Isbell & Iron Mountain.—The following board of directors was elected last week: J. B. Boyd, S. A. Blastland, C. H. Castle, of Quincy, Ill.; C. L. Richardson, of Boston, Mass.; J. E. Isbell, of Isbell, Ala.; W. H. Nance, of Russellville; and E. B. Almon, of Tuscumbia.

Lake Shore & Michigan Southern.—S. S. Hand has been appointed Superintendent of the Detroit Division, with headquarters in Detroit, vice G. H. Worcester.

Louisville & Nashville.—R. Montfort has been appointed Chief Engineer, with headquarters at Louisville, Ky. J. C. Loomis has been appointed Superintendent of the Louisville, Cincinnati & Lexington Division, vice C. R. Barnhart, assigned to other duties.

Milwaukee, Lake Shore & Western.—George S. Marsh has been appointed General Passenger and Ticket Agent in place of Charles V. McKinlay, who has been appointed General Claim Agent.

New York Central & Hudson River.—George H. Worcester has been appointed Superintendent of the Harlem Division, office at Grand Central Depot, New York. C. M. Bissell will be Superintendent of the Mohawk-Hudson Division, with office at Albany, and will have two assistants, J. H. Phyfe, office in New York, and F. H. Phillps, office at Little Falls.

Plattsmouth Belt Line.—The incorporators of this Nebraska company are: Nathan Shelton, A. A. Egbert, Otis H. Ballou, Robert B. Windham and George J. Fox.

Pullman Palace Car Co.—Robert Barry has been made General Inspector of the Pullman system, with headquarters in Chicago.

Rutland.—P. W. Clement has been chosen President under the new management of the Delaware & Hudson Canal Co.

St. Louis & San Francisco.—Edgar F. Smith has been appointed Superintendent of the Carthage Division, office at Carl Junction, Mo. His jurisdiction covers the line between Pierce City and Modesha, with the Joplin and Girard branches.

St. Louis, Vandalia & Terre Haute.—At the annual election this week the old board was re-elected with the exception of Henry S. Ives being chosen in place of Frank Crawford. The directors elected the following officers: W. R. McKeen, President; J. G. Williams, Vice-President; J. W. Craft, Treasurer, and G. E. Farrington, Secretary.

St. Paul, Minneapolis & Manitoba.—W. P. Clough has been appointed Second Vice-President of this company. M. D. Grover has been appointed General Solicitor, vice W. E. Smith, resigned.

Seneca Falls & Cayuga Lake.—The following directors were elected last week: Henry W. Pope, James E. Browne, E. M Fox, A. G. Haines, C H. Porter, George B. Frost and Charles D. Haines. The directors met and chose Henry W. Pope President, in place of George W. Stetson, and James E Browne Secretary and Treasurer, in place of Frank W. Stanley.

Union Pacific.—S. A. Hutchison has been appointed Traveling Passenger Agent, headquarters at Buffalo, N. Y., vice C. H. Phillips, resigned.

OLD AND NEW ROADS

Anaheim, Olinda & Pomona.—This company has been incorporated in California. The object is to build a road from a point near Long Beach, via Anaheim and Olinda to Pomona. Work is to begin immediately.

Arkansas, Kansas & Colorado.—Track has been laid from Bucklin, Kan., on the Chicago, Kansas & Nebraska northwest to Dodge City, 30 miles.

Atchison & Nebraska.—The Attorney-General of Nebraska has commenced proceedings in the Supreme Court to declare the franchise of this road forfeited, calling on the Court to appoint three trustees to take charge of the road, sell the franchise, pay the liabilities, and turn the balance into the school fund, as the law provides.

Atchison, Topeka & Santa Fe.—The company will at once build a road to Redondo Beach, Cal., 16 miles southeast of Los Angeles, to be in running order on March 1. The Pacific Steamship Co. will run steamers to that point.

The Strong City extension was completed to Concordia, Kan., last week, and regular trains are now running.

Atlanta & Florida.—The road was opened from Atlanta to Fayetteville, Ga., a distance of 27 miles, last week.

Atlanta & Great Western.—The company has been chartered in Georgia to build a road from Atlanta to Savannah, 150 miles, passing through Eatonton, Sparta and Waynesboro.

California Southern.—The capital stock has been increased by $1,800,000, making it $10,500,000.

Canadian Pacific.—It is reported that the company has secured control of the Richelieu & Ontario Navigation Co., and will place steel steamers on the St. Lawrence between Kingston and Montreal.

Cedar Falls & Minnesota.—The default on the coupons of this company's 7 per cent. first mortgage bonds has occasioned considerable indignation among those interested. The bonds amount to $1,377,000 and are guaranteed by the Dubuque & Sioux City road, which is practically owned by the Illinois Central, as that corporation recently acquired control of it by purchase of the stock from Mr. J. Pierpont Morgan and others. Under the old managament of the Dubuque & Sioux City the interest was promptly paid. The guarantee, which extends to 1907, has been assumed by the Illinois Central. That company is now trying to get rid of the lease and guarantee on the ground that it was fraudulently made. The Dubuque & Sioux City has begun suit to annul the lease and has obtained from local Iowa courts an injunction restraining the Cedar Falls & Minnesota from suing for rental. The hearing comes up on Jan. 10. If the injunction is removed the Cedar Falls & Minnesota will sue the Dubuque & Sioux City and the Illinois Central.

Cincinnati, Hamilton & Dayton.—President McKeen, of the St. Louis, Vandalia & Terre Haute, has filed his answer in the United States Circut Court at Indianapolis concerning the negotiations begun six months ago by Henry S. Ives for the purchase of the Vandalia. It is very voluminous, and sets forth in detail his dealings with Mr. Ives, and denies the most important assertions made by the Cincinnati, Hamilton & Dayton people. The defendant denies that he knew that there were limitations to Ives' authority in making purchases of stock for the Cincinnati, Hamilton & Dayton, or whose funds were used, or who his principals were. A copy of the only contract made between Ives and the defendant is included in the answer. This witnesses that McKeen agreed to transfer to Ives 11,160 shares of Terre Haute & Indianapolis, and 4,446 shares of Terre Haute & Logansport stock. The consideration was $250,000 cash, $639,500 upon delivery of the certificates and a note for $669,150 at 6 per cent. due Jan. 1, 1888. Certificates for 8,560 shares of the Terre Haute & Indianapolis stock, and 4,446 Terre Haute & Logansport were to be assigned to McKeen as collateral.

It is alleged that this contract was made in the presence not only of Ives but of the Cincinnati, Hamilton & Dayton's counsel, the General Manager, Vice-President, and others. Attorney Ramsey, of the Cincinnati, Hamilton & Dayton, wrote a clause of the contract. This, presumably, is an important point in the controversy, as the Cincinnati, Hamilton & Dayton avers that Ives exceeded his authority as trustee, especially in purchasing the Terra Haute & Logansport stock. The answer at great length recites the inner history of the transaction, averring that no part of the proceeds of the sale of 8,840 shares of stock were paid to defendant; that Ives never agreed to pay defendant 75 per cent. of the amount of the sale of such stock as is charged, and that a draft for $552,500 was never paid by Ives & Co., but was simply credited to the account of the Terre Haute & Indianapolis on the books of the bank, and the proceeds thereof were never paid to the company either by the complainant or by any one else. It is averred that during the time that the Terre Haute & Indianapolis and the Terre Haute & Logansport were under the control and management of Ives and Waite the surplus of the Terre Haute & Indianapolis was largely diminished, its assets wasted and applied to other than corporation purposes to the amount of more than $1,000,000, and its debts increased without benefit to the corporation to the amount of $500,000, and at the time the defendant last became President of the road the value of the stock was much less than it was when the contract was made for the sale of the stock, so that the stock now held by the defendant as collateral is at most barely adequate to pay the debt for which it is so pledged. All manner of unlawful combination is denied.

Chicago & Northwestern.—The company has finished its second survey from Pierre, D. T., to Cheyenne, Wyo.

Cincinnati, Jackson & Mackinaw.—The Ohio line has been completed to Addison Junction, Mich., connecting the Ohio and Michigan divisions of this road, forming a through line between Toledo, O., and Allegan, Mich., on the north, and Cincinnati, O., on the south.

Dayton, Fort Wayne & Chicago.—The Company made formal answer this week to the action brought for the appointment of a receiver for the road. The Company denies that it or the Dayton & Chicago issued the bonds of which the plaintiff alleges he is owner, but says that such of said series of bonds as are apparently outstanding were fraudulent and unlawfully obtained from the Trustees by Henry S. Ives, and by him disposed of on his or his firm's private account to persons concerning whom, as wellas all intermediate and present holders, including plaintiff, thedefendant claims to have no definite knowledge or information. The bonds were obtained and issued by Ives without the knowledge or consent of said companies, after the passage of resolutions by the directors of the Dayton & Chicago directing the same not to be issued, but to be canceled and destroyed.

Defendant admits that it owes debts, but their total is not so large as stated and it is small as compared to the value of its rights of way and other property and franchises; that it is about to issue bonds, secured by first mortgage on its entire line, to an amount sufficient to discharge all liens, pay off its indebtedness, complete the change of gauge of its line, and put the road in good condition. Defendant also avers that the litigation was not begun in good faith, but for the purpose of embarrassing it in its efforts to settle its debts, so that parties at whose instance suit was commenced may obtain at a low price its property and franchises. The defendant denies that it is insolvent and that its property is in any danger of loss or impairment.

Denver, Texas & Fort Worth.—The company will extend its line from Trinidad, Col., to Las Vegas, N. M., as soon as it is completed through from Denver to Fort Worth, which will be about April 15.

Duluth, South Shore & Atlantic.—Tracklaying was completed last week. This finishes the line from Duluth, Minn., to Sault Ste Marie, Mich., where connection is made by the international bridge across the Sault with the Canadian Pacific, forming a line to Montreal and the Atlantic seaboard.

Elizabethtown & Hodgenville.—Tracklaying is completed on this line in Kentucky a distance of 12 miles. The road will be operated as a part of the Newport News & Mississippi Valley.

Ellsworth & Limestone Valley.—Incorporated in Kansas. The road is to extend from Ellsworth via Lincoln Centre, Glen Elder, Ionia and Salem to the state line, about 100 miles.

Ferries & Cliff House.—Incorporated in California to build a road 25 miles in length. Capital stock, $2,500,000.

Houston & Texas Central.—At Sherman, Tex., judgment has been rendered in favor of Gunter & Munson of that place against this road, H. B. Sanborn and J. F. Glidden for 3,130 acres of land, and against the railroad company, in favor of Sanborn & Glidden for $14,628. This is a case where Gunter & Munson located on lands owned by the railroad company, and which the latter had given into the hands of Sanborn & Glidden, who had put improvements on it. The total judgments against the company will amount to about $100,000.

Indianapolis, Decatur & Western.—The Mackey syndicate consummated the negotiations for this road last week, and took possession on Jan. 1. It has not been decided where the general offices of the company will be located.

Indianapolis & Vincennes.—The company will build a branch from Spencer to Patricksburg, in Owen County, Ill., to reach valuable coal deposits.

Kinzua & Allegany.—Work was begun this week. The road will run from a point about 10 miles from Bradford, Pa., to Red House, in Cattaraugus County, N. Y. About 22 miles of standard gauge road will be built at once, and later on more will be laid. The Allegany Lumber Co. will own and operate the road. Daniel Shine, of Olean, N. Y., Roadmaster of the Olean, Bradford & Warren, has charge of the work.

Lake Valley.—This California company has filed articles of incorporation to permit its private road to become a common carrier. It is a lumber line, 5 miles in length.

Louisville & Nashville.—The Cumberland Valley extension was opened last week from Corbin to Barboursville, Ky., about 30 miles.

Louisville, New Albany & Corydon.—It is stated the road will be sold this month to satisfy a judgment of $128,000 in favor of Robert A. Watts, Trustee, acting for the first mortgage bondholders.

Louisville Southern.—The company has secured the necessary funds for building the road from Louisville to Harrodsburg, Ky., where it will connect with the Cincinnati Southern.

The company is asking bids for 100 flat, 200 coal and 200 box cars.

Marietta & North Georgia.—An issue of consolidated first mortgage bonds, amounting to $3,300,000, was sold last week. One million goes to London and the remainder was bought for a New York and Southern syndicate. It is now stated that the road will be pushed rapidly to completion. The narrow gauge of the present line between Marietta, Ga., and Murphy, N. C., will at once be made standard and the extension northward from Murphy to Knoxville, Tenn., and southward from Marietta to Atlanta, Ga., be built at once. It is expected to have the entire line finished within 18 months.

Minnesota & Dakota.—The letting of the contract of this road from Fargo, Dak., for a distance of 200 miles has been previously reported. Job Voak & Co., of Wilmot, Wis., are the contractors. One hundred miles are to be completed Oct. 15, 1888, and the other 100 by Nov. 15, 1889. Isaac Britton, of Fargo, Dak., is general manager.

Minnesota & Northwestern.—The tunnel in Rice township, Ill., is completed, and the track will soon be laid, completing 52 miles of the road in Davies and Stephenson counties. The tunnel is 2,460 ft. long, 25 ft. wide and 25 ft. high. The boring was begun on April 1, 1887.

The company has filed a mortgage for $2,000,000 in favor of the Metropolitan Trust Co., of New York.

Missouri Pacific.—There has been an order issued for a reduction of 10 per cent. in the number of employés of all departments of the Gould system. The order will be in force until March 1, when the men will be taken back. This is in accordance with the agreement not to cut the wages but to reduce the force.

Mobile & Ohio.—On Jan. 1 the company opened its line for through business between New Orleans and St. Louis. Pullman and Mann boudoir cars are run on the through trains.

Nashville & Knoxville.—J. C. Rodemer, of Gallatin, Tenn., has the contract for 22 miles of road from Cookville to Pavey Fork, Tenn.

New Haven & Derby.—The stockholders have authorized the directors to build the extension to a connection with the Housatonic. This will probably be from Birmingham to Bottsford, Conn., a distance of 13½ miles.

Newport & New York Rapid Transit.—There was a conference at Newport, R. I., last week between representatives of this company and those of the Narragansett Pier Railroad Co., and Captain Joseph P. Cotton was engaged to make preliminary surveys for the connection of the two lines.

New Roads.—William H. Wood, of San Francisco, has obtained right of way for a road to commence at Tepic, state of Jalisco in Mexico, and run northwest to Mazatlan, on the coast, in the state of Sinaloa, thence northwest through that state, touching a number of important cities, to connect with the Southern Pacific road at Yuma, Arizona Territory. Work will begin in May and will require three or four years for completion. Surveyors will go out at once.

A new road is to be built from Fountain to Brazil, Ind., and work is to begin at once. The new line will follow the old towpath of the Wabash Canal to a point near West Union, where it leaves the towpath and proceeds to Rockville. There it strikes an old grade, already built for several miles, and runs to Bridgeland and on to Brazil.

New York Central & Hudson River.—On and after Jan. 1, 1888, the main line of the New York Central & Hudson River will be divided into two divisions instead of three; the first being the Mohawk-Hudson Division, extending from New York to De Witt (Syracuse), and the Western Division, from De Witt to the Western termini, as at present. The Harlem Division will remain as heretofore, having a division superintendent separate from the Hudson River Division.

North & South, of Indiana.—It is stated that this road is to be built from some point in Fountain County, Ind., to Brazil, work to begin the coming spring.

North Topeka, Silver Lake & Rossville.—This road will be built next spring from North Topeka to Rossville, Kan., a distance of 18 miles.

Odessa, Fort Stockton & San Antonio.—J. O. Kulp and others, representing the Chicago, Rock Island & Pacific, have obtained a charter for the above road in Texas. It will be built from Odessa, on the Texas & Pacific, northward to a junction with the Rock Island at its present terminus on the southern boundary of Kansas, near No Man's Land. Last week Mr. Kulp met the Citizens' Association of San Antonio, an organization composed of the leading men of that place, and made a proposition to extend the new road from Odessa to San Antonio within 18 months in consideration of $100,000 in real estate to be given the company by the city. The proposition was accepted.

Ohio River.—All the passenger conductors but one on this road between Wheeling and Point Pleasant, W. Va., were discharged last week. The cause is alleged plundering.

Track has been laid from Point Pleasant to Guyandotte, W. Va., 40 miles.

Oregon Pacific.—Nelson Bennett, contractor, has begun suit against this company for $550,000 alleged indebtedness.

Pennsylvania.—The company is now running a new train of Pullman vestibule cars, heated by steam, which leaves New York in the morning and arrives in Jacksonville, Fla., the next afternoon at 4 o'clock. The train is run three times a week, Monday, Wednesday and Friday.

Philadelphia & Reading.—The road passed out of the Receivers' hands and into the control of the stockholders of

Jan. 2. Much of the work of the Receivers is unfinished, and a number of meetings will be necessary to complete the details. During the three years and seven months of the receivership the Receivers have vouched for $165,000,000 in conducting the business of the road and the coal and iron company. An election will be held on Jan. 9. The voting power is vested for five years in a trust, and virtually the Drexel-Morgan syndicate will control the election.

Plattsmouth Belt Line.—Incorporated in Nebraska. The object is to build a road around the city of Plattsmouth, with diverging lines to South Omaha, Omaha and Beatrice.

Poughkeepsie & Southwestern and Poughkeepsie, Hartford & New England.—Articles of consolidation uniting these two roads have been filed in New York state. Capital stock, $1,400,000.

Quincy & Beardstown Short Line.—Articles of incorporation have been filed in Illinois. The road is to built from Quincy through the counties of Adams, Brown and Cass to Beardstown. Captial stock, $1,000,000.

Rome, Watertown & Ogdensburg.—The company gives notice of an increase of $1,763,200 in the share capital for exchange, share for share, for the stock of the Oswego Railroad Bridge Co., and on terms not made known for the stock of the Utica & Black River road, which is now operated under a perpetual lease.

Rutland.—The road formally passed into the hands of the Delaware & Hudson Canal people this week. At a meeting in Rutland the directors of the Rutland road resigned and their places were filled by members of the Delaware & Hudson Canal directory.

Savannah, Florida & Western.—The engineers on this road have had their pay increased to $4 per day.

Shenandoah Valley.—In the case of the Fidelity Trust Insurance & Safe Deposit Co. against this company, involving a bitter contention between the first and general mortgage bondholders, the Circuit Court at Roanoke, Va., has decided the cause in favor of the general mortgage bondholders, holding that they are entitled to the first lien on the road from Waynesboro to Roanoke, a distance of 95½ miles, and that the $1,560,000 of first mortgage bonds now in the treasury of the Fidelity Trust Insurance & Safe Deposit Co. are the absolute property of the general mortgage bondholders. As to the income bonds, the decision of the Court is for the present reserved.

Shenango & Allegheny.—The company is to be reorganized this month, the meeting of bondholders being advertised for Jan. 14. It is intended at an early date to consolidate with the West Penn & Shenango Connecting road, which runs from Hillierd to Butler, Pa.; also with the Erie, Shenango & Pittsburgh, which is now being built from Greenville to Erie, Pa. A small portion of this road from Greenville to Amasa Junction, where a connection has been made with the Ashtabula branch of the Lake Shore & Michigan Southern, will be completed this month. It is the purpose of the management to push the completion of this road to Lake Erie as rapidly at possible, and it is hoped to finish the entire line as early as July 1, 1888.

Southern Pacific.—The survey was begun last week on the new branch from Oakdale, Cal., to Posa, Kern County, along the foothills on the eastern side of the San Joaquin Valley.

Staten Island Rapid Transit.—The extension to South Beach was opened this week. Three new stations are added.

Toledo, St. Louis & Kansas City.—The management has arranged to get money for the purpose of widening the gauge of the road between Frankfort, Ind., and St. Louis.

Vancouver, Klickitat & Yakima.—Arrangements have been made to float the bonds of this company in Washington Territory, and money enough has been advanced for construction. Engineers are now making a permanent location, and the profiles will be ready for contractors this month. The road commences at Vancouver, running across the Cascade Mountains through a rich coal and timber country.

TRAFFIC AND EARNINGS.

Traffic Notes.

The trunk lines have made a special rate for a number of articles of iron and steel manufacture on a basis of 30 cents per one hundred lbs. between New York and Chicago in less than car loads, and 20 cents in car loads.

The irregularities in freight rates between St. Louis and Chicago continue. Rates on live stock by the car load have been reduced by successive cuts from $22.50 to $10 per car. There are also reports of reductions in rates from St. Louis to Toledo and Detroit, which are said to have been started by the Chicago & Alton.

The ticket brokers of Chicago are said to be selling tickets to Kansas City at $2.50 under regular rates, using tickets issued by the Kentucky Central, from Ohio River points through, which have been originally sold at the rate from the starting point to Kansas City via St. Louis. The tickets read from Chicago over the Chicago & Alton and the Chicago, Rock Island & Pacific.

The St. Louis & San Francisco announces a reduction, Jan. 18, in corn rates from local stations in southern Kansas to St. Louis of 5 cents per 100 lbs. This is said to be done in consequence of the competition of the Kansas City, Springfield & Memphis.

Six of the roads in the Western States Passenger Association have withdrawn from the association. They are the Chicago & Alton, Illinois Central, Minnesota & Northwestern, Central Iowa, Burlington, Cedar Rapids & Northern and Milwaukee & Northern. A meeting of the association will be held Jan. 11.

Mileage Tickets.

The Illinois Central announces that 1,000-mile tickets will hereafter be sold at $25 each, with a rebate of $5 on return of the empty cover at any time within a year. This makes a net rate of 2 cents a mile, and at the same time tends to prevent speculation in the tickets. The proposal to apply this rebate plan to these tickets (which are limited to a single person, or to a firm) has been considerably discussed by the Chicago roads, but the above is the first positive action that has been taken.

Cotton.

The cotton movement for the week ending Dec. 30 is reported as below, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c.
Receipts	96,570	124,808	D. 28,238	22.6
Shipments	106,365	114,777	D. 8,412	7.3
Stock	493,883	443,565	I. 50,318	11.3
Seaports:				
Receipts	188,824	236,618	D. 47,794	20.2
Exports	130,098	166,391	D. 36,293	21.8
Stock	1,066,472	1,118,884	D. 52,412	4.6

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

	1887.	1886.	Inc. or dec.	P. c.
Month of December:				
Buff., R. & Pitts.	184,802	137,918	I. 46,884	33.4
Chi. & Atl.	193,418	185,784	I. 7,634	4.1
Chi. Mil. & St. P.	2,417,000	2,250,240	I. 266,760	11.8
Den. & R. G.	709,500	635,216	I. 74,284	11.6
Long Island	211,183	184,224	I. 26,959	14.6
Mil., L. S. & W.	182,653	172,275	I. 10,378	5.9
Norfolk & West.	371,345	148,213	I. 123,132	83.0
Northern Pac.	1,174,093	899,665	I. 274,428	3.5
Ohio River	33,574	17,811	I. 15,763	88.5
St. L. & San F.	581,300	472,600	I. 108,700	23.0
Month of November:				
Allegheny Val	173,830	160,623	I. 13,207	8.2
Net	77,349	62,348	I. 15,001	24.0
Balt. & Potomac	128,816	118,192	I. 10,624	8.9
Net	45,344	23,547	I. 21,797	92.7
Cam. & A. & Br.	34,618	31,810	I. 2,808	8.8
Net	Def. 7,475	Def. 3,072	D. 4,403	...
Canadian Pac	1,286,237	1,073,286	I. 212,951	19.8
Net	511,099	448,237	I. 62,862	14.0
Carolina Central.	57,173	50,962	I. 6,211	12.1
Net	17,020	24,002	D. 6,982	29.0
Cen. of Georgia	743,227	704,259	I. 38,968	5.5
Net	342,902	317,390	I. 25,512	8.0
Chi., B. & Q.	2,382,965	2,256,339	I. 126,626	5.5
Net	1,184,048	1,149,732	I. 34,316	2.9
Cl., C., C. & I.	424,437	374,123	I. 50,314	13.4
Net	181,445	170,784	I. 10,661	6.2
Den. & R. Gran. W.	117,986	101,450	I. 16,536	16.2
Net	36,909	45,672	D. 8,763	19.1
Ft. W. & Den. C.	73,167	52,476	I. 20,691	39.4
Net	30,282	30,269	I. 13	...
Gr Rapids & Ind.	249,813	247,738	I. 2,075	.8
Net	61,023	91,422	D. 30,399	33.2
Louis. & Nash.	1,501,898	1,281,997	I. 219,901	17.1
Net	626,282	530,858	I. 95,424	17.9
Lou., N. O. & T.	296,227	241,501	I. 54,726	22.6
Net	124,619	110,154	I. 14,465	13.1
Memphis & Chas.	191,023	175,408	I. 15,615	8.8
Net	59,674	75,360	D. 15,686	20.7
Mexican Central.	468,089	379,902	I. 88,187	23.2
Net	205,759	179,572	I. 26,230	14.5
N. Y., L. E. & W.	2,390,397	2,250,520	I. 139,877	6.2
Net	607,090	634,615	D. 27,525	4.3
Norfolk & West.	410,211	337,709	I. 72,502	21.4
Net	178,392	132,693	I. 45,699	34.4
North. Central	542,158	493,150	I. 49,008	9.9
Net	102,177	197,926	D. 95,749	48.8
Northern Pacific.	1,640,140	1,499,906	I. 340,234	26.1
Net	904,817	749,247	I. 155,570	20.7
Pennsylvania	4,735,154	4,347,218	I. 387,936	8.9
Net	1,356,190	1,526,721	D. 170,531	11.1
Seab'd & Roan.	71,499	73,814	D. 2,315	3.1
Net	34,584	41,077	D. 6,493	15.7
Union Pacific	2,597,585	2,351,431	I. 246,154	10.4
Net	1,171,510	914,675	I. 256,835	28.0
West J. and Brs.	98,959	95,154	I. 3,805	3.9
Net	13,602	29,076	D. 15,474	53.1
West., N. Y. & P.	233,575	206,938	I. 26,637	12.8
Net	32,397	32,494	I. 503	100.6
Total (gross)	20,848,184	18,705,906	I. 2,142,278	11.4
Total (net)	7,897,639	7,514,756	I. 764,888	...
			D. 382,005	...
Net			I. 382,883	5.0
Month of October:				
Eliz., Lex. & B. S.	112,635	90,674	I. 21,961	24.2
Net	53,476	33,482	I. 19,994	59.6
Wabash	669,753	652,020	I. 27,733	4.2
Net	*176,920	220,698	D. 43,770	19.8

* The amount spent for improvement of track and equipment in October, 1887, and charged to expenses, was $55,407 in excess of 1886.

Two months—Oct. 1 to Nov. 30:				
N. Y., L. E. & W.	4,940,406	4,691,224	I. 249,182	5.3
Net	1,388,195	1,412,428	D. 24,233	1.6
Three months—Oct. 1 to Nov. 30:				
N. Y. C. & H. R.	9,990,000	9,021,256	I. 968,744	10.7
Net	3,610,000	3,562,507	I. 47,493	1.3
Ten months—Jan. 1 to Oct. 31:				
Eliz., Lex. & B. S.	905,119	766,826	I. 138,293	18.0
Net	233,384	168,660	I. 61,724	22.9
Wabash	5,763,941	5,620,129	I. 143,812	25.5
Net	1,870,974	1,503,269	I. 367,705	24.4
Eleven Months—Jan. 1 to Nov. 30.				
Alleg. Val.	1,850,060	1,655,930	I. 194,130	11.1
Net	724,042	616,640	I. 107,402	17.4
Balt & Poto	1,326,349	1,235,019	I. 91,330	7.3
Net	501,843	483,019	I. 18,824	3.8
Cam. & Atl. & Brs.	644,920	569,498	I. 75,422	13.2
Net	144,878	138,036	I. 6,842	4.9
Can. Pac	10,454,072	9,187,702	I. 1,266,970	13.7
Net	3,140,411	3,423,241	D. 282,830	8.2
Cent. of Georgia	6,042,528	5,580,863	I. 461,665	8.2
Net	2,146,190	1,765,849	I. 380,341	21.5
Chic., B. & Q.	25,448,822	24,359,977	I. 1,088,845	4.4
Net	11,462,885	11,854,352	D. 391,467	3.3
Cl., C., C. & I.	4,199,716	3,801,659	I. 398,057	10.4
Net	1,645,321	1,437,482	I. 207,839	14.1
Den. & R. G. W.	1,079,383	961,400	I. 117,983	12.2
Net	320,186	322,068	D. 1,882	.5
F. W. & D. C.	644,375	399,230	I. 245,145	61.4
Net	272,699	180,980	I. 91,719	50.6
G. Rap. & Ind.	2,715,534	2,287,610	I. 427,924	18.7
Net	896,110	769,748	I. 126,362	16.4
Mem. & Char.	1,550,196	1,266,841	I. 283,355	22.3
Net	365,354	412,925	D. 47,571	11.5
Mex. Central.	4,346,522	3,416,726	I. 929,797	27.2
Net	1,882,355	1,172,702	I. 709,653	60.5
Norf. & West.	3,848,366	2,984,721	I. 863,645	28.9
Net	1,588,955	1,200,136	I. 388,819	32.3
North. Central	5,722,641	5,016,809	I. 705,832	15.0
Net	1,883,678	1,768,444	I. 115,229	6.5
North. Pacific.	12,672,547	11,429,887	I. 1,242,660	10.8
Net	5,573,294	5,756,664	D. 183,370	3.1
Pennsyl.	50,778,349	45,950,853	I. 4,827,496	10.5
Net	17,202,833	16,361,300	I. 841,533	5.1
Un. Pacific	26,313,894	23,936,643	I. 2,377,251	9.9
Net	11,176,781	8,947,789	I. 2,228,992	24.9
W. Jer. & Brs.	1,370,320	1,268,891	I. 101,429	8.4
Net	496,927	487,519	I. 9,408	1.9
W. N. Y. & Ph.	2,579,154	2,378,515	I. 200,635	8.4
Net	546,374	409,412	I. 136,962	33.4
Total (gross)	163,588,349	147,688,778	D. 15,899,571	10.7
Total (net)	61,970,111	57,608,306	I. 5,308,925	...
			D. 907,120	...
Net			I. 4,461,805	7.7

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Coal.

The coal tonnages for the week ending Dec. 31 are reported as follows:

	1887.	1886.	Inc. or dec.	P. c.
Anthracite	536,521	548,984	D. 12,463	2.2
Bituminous	327,611	251,299	I. 76,312	30.3

The Cumberland coal trade for the week ending Dec. 26 amounted to 53,163 tons, and for the year to that date 3,269,707 tons.

The coal tonnages of the Pennsylvania road for the week ending Dec. 31 are reported as follows:

	Coal.	Coke.	Total.
Line of road	252,566	91,445	344,011
Year to date	10,472,283	3,757,344	14,229,627
1886 to date	8,740,472	3,549,645	12,290,117

ANNUAL REPORTS.

Rome, Watertown & Ogdensburg.

The report is for the year ending Sept. 30, 1887. The company operates a line from Niagara Falls to Massena Springs, 301 miles; Utica to Ogdensburg, 134; and other lines, 207 miles; a total of 642. The equipment was 89 locomotives, 139 passenger and baggage cars and 2,347 freight and other cars.

The earnings and expenses were as follows:

	1887.	1886.	Inc. or dec.	P. c.
Freight	$1,930,718	$1,453,422	I. $477,296	32.8
Passenger	991,525	774,128	I. 217,397	28.0
Mail	62,466	62,431	I. 35	....
Express	74,419	54,586	I. 19,833	36.3
Car service	71,529	58,448	I. 13,081	22.3
Telegraph	5,071	1,822	I. 3,249	180.5
Miscellaneous	2,720	1,956	I. 764	38.2
Total	$3,138,448	$2,406,793	I. $731,655	30.3
Expenses	1,726,001	1,395,117	I. 330,884	23.7
Net earnings	$1,412,447	$1,011,676	I. $400,771	39.6
Gross. earn. per mile.	4,888	3,820	I. 1,068	28.1
Net " " "	2,200	1,605	I. 595	37.1
P. c. exps.	54.9	57.9	D. 3.0	...

The expenses were divided as follows:

	1887.	1886.	Inc.	
Conducting transportation	$513,671	$423,376	I.	$90,295
Motive power	531,029	408,447	I.	122,582
Maintenance of cars	173,332	121,632	I.	51,700
" " way	297,685	354,789	I.	42,896
General expenses	107,791	85,991	I.	22,790
Telegraph	2,493	1,872	I.	621

In the above statement the earnings of the Utica & Black River are included for the whole current year, and for 6 months of the year ending Sept. 30, 1886. The following statement includes the earnings and expenses of the two companies for both years:

	1887.	1886.	Inc.	P.c.
Gross earnings	$3,138,447	$2,806,965	I.	$331,482	11.8
Net "	1,412,446	1,222,839	I.	189,607	15.5

The income account was as follows:

Balance from Sept. 30, 1886		$303,757
Gross earnings		3,138,447
Rents		8,253
Interest and dividends from investments		22,750
		$3,473,208
To transportation expenses	$1,726,001.26	
Taxes	123,609.02	
Interest	523,764.75	
Rental leased lines	295,786.03	
Dividend Feb. 15, 1887	115,125.00	
" Aug. 15, 1887	161,700.00	
Balance	427,221.61	
		3,473,208

The general balance sheet was as follows, condensed:

Liabilities:		
Capital stock		$5,390,100
Funded debt		12,367,000
Interest		14,708
Bonds and mortgages		33,000
Lease warrants for equipment purchased		22,130
Miscellaneous		441,031
Profit and loss (surplus)		427,221
		$18,695,280
Assets:		
Cost of road	$15,389,163	
Stocks and bonds	1,788,262	
Real estate	58,974	
Telegraph line	24,458	
Equipment account	142,186	
Due by agents	71,971	
Materials and supplies	163,585	
Cash on hand	389,867	
Sinking fund	178,500	
Miscellaneous	437,314	
		18,695,280

Some of the traffic statistics are as follows:

	1887.	1886.	Inc.
Pass. train mileage	1,346,159	1,155,203	I. 190,956
Freight " "	1,157,674	1,095,759	I. 61,915
Passengers carried	1,318,249	1,040,014	I. 278,235
Passengers carried one mile	39,559,306	26,580,145	I. 2,979,161
Tons freight carried	1,461,768	1,128,864	I. 332,904
Tons freight carried one mile	142,217,116	105,270,929	I. 36,946,187

During the year 17.22 miles of road have been laid with 60-lb. steel rails; 35 miles have been ballasted and the work will be continued next season.

Two Mogul locomotives, 18 × 24, with 50-in. drivers, 12 passenger coaches and 6 box cars have been received from the builders. The company has also rebuilt 6 locomotives, 9 passenger coaches and 261 freight cars. Further equipment will be required during the next year.

Two trains are equipped with the "Safety" Co.'s system of continuous heating. The Norwood & Montreal Railroad, owned by this company, was completed from Norwood to Massena Springs in September, 1886. The Massena Springs & Fort Covington Railroad Co. is building its road from Massena Springs to Fort Covington, and the outlook is that early in 1888 this link will be completed, and a through rail route established between Montreal and all points on the R., W. & O. road. The work upon the branch into Rochester has been carried on, and terminals have been secured on both sides of the river. A spur from the main line has been built from Charlotte north to Lake Ontario.

The iron bridges built, and those contracted for, are proportioned for the heaviest equipment now in use, and are fully up to the Pennsylvania Railroad standard. One deck, plate-girder of 60-ft span was built at Booneville. A new bridge over the Genesee River at Rochester was in course of construction at the close of the fiscal year, and was completed but a few days thereafter. It is a deck bridge and viaduct, 705 ft. long, divided into eleven spans. A deck bridge 317 ft. long is now in the course of construction over the Salmon River near Pulaski, which consists of five spans.

The building of an independent telegraph line enabled the officers of the company to make a contract for its operation with the Western Union Telegraph Co. for twenty years and the result is a large increase in telegraph earnings.

A new line was opened in the Adirondacks, via Norwood, which gives a short cut for reaching the north woods.

The Ontario Dispatch Fast Freight Line, running over the New York, Ontario & Western, has been organized.

In the last report the plan for retiring the income bonds of this company was mentioned. Under this plan $1,835,000 of the income bonds were deposited with the Central Trust Co., and consolidated bonds and stock issued therefor. Interest was stopped on the bonds, April 30, 1887, and at the date of the report all but $13,000 of the income bonds were in the control of the company.